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ol. 3 May, 1952 No. 5

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological literature in every language.

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SUBSCRIPTION RATE: $6.00 per year to members and non members. Single and back issues $2.00. Back volumes, $10 per volume.

This publication has been made possible through support and sponsorship extended by the Geophysics Research Division of the Air Force Cambridge Research Center, Air Research and Development Command under Contract No. A. F. 19 (604)-302.

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 3 MAY 1952 No. 5

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Objective Forecasting

(For complete table of contents see back cover)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 3 Joy Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains from 175 to 300 abstracts of current periodical literature and monographs in the fields of meteorology, hydrology, oceanography, etc. These abstracts are arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of from 50 to 250 important references on a special subject without respect to recency of material. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject. Preference is given to recent material, comprehensive works, material from obscure sources, and items with good bibliographies.

Bibliographies previously published were:

No.	Mo.	Vol. I, 1950	Vol. II, 1951
1.	Jan.	**Atmospheric Pollution**	**Extended Forecasting**
2.	Feb.	**Aerobiology**	**Long Range Forecasting**
3.	March	**Cloud Physics and "Rain Making"**	**Soil Temperature**
4.	April	**Hail**	**Constants, Units, Tables and Diagrams**
5.	May	**Tornadoes**	**Climate of the Near East**
6.	June	**Volcanic Dust**	**Climate of the Middle East**
7.	July	**Climatic Changes**	**Special Winds**
8.	Aug.	**Thunderstorms**	**Radar Storm Detection**
9.	Sept.	**Icing**	**Condensation Trails**
10.	Oct.	**Acoustical Propagation**	**Climate of Northeast Africa**
11.	Nov.	**Evaporation**	**Mountain Meteorology**

Bibliographies published this year were:

1. **Climatology of Northwest Africa,** Vol. III, No. 1, Jan. 1952
2. **Carbon Dioxide,** Vol. III, No. 2, Feb. 1952
3. **Climate of Paraguay, Uruguay and Argentina,** Vol. III, No. 3, March 1952
4. **Dew,** Vol. III, No. 4, April 1952
5. **Objective Forecasting,** Vol. III, No. 5, May 1952

Forthcoming bibliographies will be:

6. **Stratus Forecasting,** Vol. III, No. 6, June 1952
7. **Urban Climatology,** Vol. III, No. 7, July 1952
8. **Climate of Central Africa,** Vol. III, No. 8, Aug. 1952

Other bibliographies in preparation are:

Actinometers
Climate and Cancer
Climate of Southeast Asia and the East Indies
Frost and Frost Forecasting
Glazed Ice
Machine Methods in Meteorology
Microwave Propagation
Oceanographic Meteorology
Ozone
Tropopause Variations
Turbulence
Visibility

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the June and December issues cumulative indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.
NN:	New York Public Library, New York, N. Y.
NNA:	American Geographical Society Library, New York, N. Y.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5–6):146–151, May–June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vol. 2), *Heft* 5–6 (No. 5 and 6), *pages* 146–151, May–June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

COMPENDIUM ARTICLES AND WORKS OF SPECIAL INTEREST

3.5–1 551.5(02)

aufm Kampe, Hans Joachim, **Das Wetter und seine Ursachen; neuere Erkenntnisse vom Wettergeschehen.** [Weather and its causes; new knowledge on weather processes.] Darmstadt, Dietrich Steinkopff, **1951.** 164 p. photos, graphs, charts, 82 refs.—This book aims to acquaint students and laymen with the physical processes in the atmosphere that underlie weather phenomena and to provide a summary of the developments in meteorology during the past twenty-five years, especially the various theories on cyclogenesis. The chapters cover the following subjects: a description of the synoptic weather service of Germany; the physical principles of weather processes; the general circulation of the atmosphere with special reference to the Northern Hemisphere; the circulation of extratropical latitudes in the Northern Hemisphere; the various theories of cyclogenesis—the Norwegian cyclone theory, the convergence-divergence theory of SCHERHAG, the theory of stratospheric steering and the equilibrium theory of cyclones of RAETHJEN; the high ice clouds; artificial influencing of clouds and precepts for weather forecasting. The theoretical discussion is mathematical and many diagrams are presented. *Subject Headings:* **1. Weather 2. Cyclogenesis 3. Cyclone theories 4. General circulation 5. Weather forecasting 6. Textbooks 7. Northern Hemisphere.**—*I.L.D.*

3.5–2 551.511:551.576.11

Austin, James M., **Cumulus convection and entrainment.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 694–701. 8 figs., table, 16 refs., 10 equations.) **DWB**—Examines development of cumulus convective cells in an atmospheric layer in unstable equilibrium, introducing entrainment by turbulent mixing. A technique of computing lapse rate within a cloud, intermediate between environment and moist adiabatic, is described and thermodynamic processes analyzed. The observed virtual temperature difference of less than 1°C between cloud and environment is sufficient to explain phenomena. The results are applied to calculate dilution of cloud mass and variation of liquid water content with height. The relative humidity of the environment is as important for convective showers as the vertical instability. Prediction of cumulus development in convectively unstable air or by surface heating is discussed, but some difficulties remain. *Subject Headings:* **1. Convective cells 2. Cumulus cloud formation 3. Entrainment.**—*C.E.P.B.*

3.5–3 551.515.11

§Bjerknes, J., **Extratropical cyclones.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 577–598. 14 figs., 2 tables, 32 refs., 16 equations.) **MH-BH, DWB**—This lucid statement sets out the dynamics of cyclones in which a vortex extends upwards into a wave trough in the upper westerlies. In the vortex, convergence to E. and divergence to W. would cause westward motion; eastward motion can be explained only by the flow pattern in the upper westerlies. In short upper waves (about 30° long), crests are preceded by horizontal convergence and troughs by divergence. A cyclone deepens when this divergence overcompensates frictional convergence. Increased divergence results from lowering level of nondivergence, hence, large, deep cyclones slow down. Vorticity changes are fully discussed. Frontal genesis in straight SW currents by adiabatic movement on isentropic surfaces is examined, stability conditions are set out and possible effects on divergence in upper troposphere suggested. These ideas are illustrated by synoptic developments over North America, Nov. 7–10, 1948. *Subject Headings:* **1. Cyclone dynamics 2. Cyclone structure.**—*C.E.P.B.*

3.5–4 551.515.4 551.594.21

†Byers, Horace R., **Thunderstorms.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 681–693. 7 figs., 49 refs.) **DWB**—This study of much recent work, including the Thunderstorm Project, describes cell structure, circulation and thermodynamics of stages: cumulus (up draft), mature (local turbulence and entrainment) and dissipation (downdraft). Entrainment by rising air is especially important. Surface weather includes rainfall pattern, wind field (downdraft cold dome), temperature, pressure (especially pressure nose) and humidity (notably humidity dip accompanying downdraft). Recent work on thunderstorm electricity is summarized and radar studies described. Travel is related to vector mean wind, with preference for rugged relief or heat sources; pre-cold-front squall zones favor line thunderstorms. Forecasting, and aviation risks from violent gusts and updrafts are discussed. Finally, many unsolved problems are enumerated. *Subject Headings:* **1. Thunderstorms 2. Thunderstorm Project.**—*C.E.P.B.*

3.5–5 551.511:532.5

Haurwitz, B., **The perturbation equations in meteorology.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 401–420, 21 refs., 136 equations.) **MH-BH, DWB**—Many mathematical difficulties of dynamic meteorology are avoided by the method of small perturbations superposed on undisturbed (e.g., geostrophic) motion. Many problems deal with stability, e.g., whether a perturbation will grow. The equations of state are set out, discussion being limited to adiabatic changes (piezotropic, autobarotropic); Eulerian (space) and Lagrangian (particle) systems of analysis are compared. The basic perturbation equations of motion, continuity and physical change are set out, and the use of special coordinates for typical problems, including wave motion, considered. The simplifying assumptions of quasi-static or quasi-geostrophic motion are examined. The methods discussed cover only the initial stages of unstable perturbations, and the future problem of studying further developments is discussed. *Subject Headings:* **1. Dynamics of the atmosphere 2. Hydrodynamics 3. Mathematical techniques.**—*C.E.P.B.*

3.5–6 551.513

†Namias, Jerome and Clapp, Philip F., **Observational studies of general circulation patterns.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 551–567. 12 figs., table, 61 refs.) **MH-BH, DWB**—Normal circulation in troposphere and lower stratosphere, including jet stream, is shown by mean monthly charts. Long wave systems (2500+miles), convergence and divergence, sources of energy and moisture, and method of study are described. Irregular variations, especially of type and strength of circulation pattern, are examined, blocking is illustrated and the index cycles of zonal and meridional circulations analyzed. Observed behavior of large scale patterns is related to theoretical results; relations between wave length, amplitude and wind speed agree with those expected from constant vorticity trajectories. WILLETT's correlations between various characteristics of the circulation are summarized. Suggestions for future work deal largely with improvement of data. *Subject Headings:* **1. Atmospheric circulation 2. Waves in the westerlies.**—*C.E.P.B.*

3.5–7 551.509.31

§Oliver, Vincent J., and Oliver, Miloreo B., **Meteorological analysis in the middle latitudes.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 715–727. 4 figs., 24 refs.) **DWB**—Authors examine completeness and simplicity of synoptic analytical practice and the bearing on current research. Pressure jumps need more attention. Radar calls for different cloud analysis, e.g., by BELLAMY's method. German and U. S. methods of analyzing upper air charts and time cross-sections are described. Authors then advocate coordination of sea level and upper air analysis, including standardization of map scales and units. Examples of superposition of 700 mb on surface charts (Oct. 24–26, 1949) show value of combined analysis. Consideration of moisture distribution for shower forecasting leads to recommendation for resumption of isentropic charts plus charts of relative motion. *Subject Headings:* **1. Synoptic analysis 2. Synoptic charts.**—*C.E.P.B.*

3.5–8 551.515.127:551.513.1

§†Palmén, Erik, **The aerology of extratropical disturbances.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 599–620. 16 figs., 64 refs., 17 equations.) **DWB**—This comprehensive study relates the 3-dimensional structure of cyclones to the hemisphere circulation. Tropical air above and polar air below tend to develop a frontal zone with concentration of kinetic as well as potential (solenoidal) energy and therefore a jet stream. Orographic, thermodynamic and instability disturbances of zonal flow form long waves to which displacements of free air polar front are related, each wave associated with a cyclone family. Development of individual cyclones is related to excess of upper divergence over lower convergence. Diagram, charts and sections Nov. 17–19, 1948, show growth of occluded cyclone from a weak upper trough. The meandering of a westerly current at 500 mb ending in cutting off a cold air mass to S. (closed cold cyclone) and warm mass to N. (warm upper anticyclone) is illustrated. Finally, a general survey is given. *Subject Headings:* **1. Atmospheric circulation 2. Extratropical cyclones.**—*C.E.P.B.*

3.5–9 551.513.1:551.556:551.4

Priestley, C. H. B., **A survey of the stress between the ocean and atmosphere.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences,* 4(3):315–328, Sept. **1951.** 4 figs., 3 tables, 10 refs., 4 equations. **MH-BH**—A survey is made of the mean east-west component of stress between the ocean and atmosphere for each season and each ocean, and for the mean of all oceans. The averaging is carried out for each 5° latitude zone from 55°N to 55°S. The result provides a first approximation to the total torque about the earth's axis, on the atmosphere as a whole, in the various latitude belts. From them is derived a table showing the distribution of total northward flux of atmospheric angular momentum for the annual mean and the four seasons individually, allowing for the changes occurring during spring and autumn. A brief comparative discussion of both the stress and flux results is given. *Subject Headings:* **1. Ocean-atmosphere stress 2. Ocean-atmosphere interaction 3. General circulation 4. Angular momentum flux.**—*Author's abstract.*

3.5–10 551.511:551.513.1

Starr, Victor P., **Applications of energy principles to the general circulation.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 568–576. 11 refs., 26 equations.) **MH-BH, DWB**—A discussion of the global balance of energy. Kinetic energy of horizontal motion is first examined for a gas in a closed chamber (of unlimited height) subject to turbulent motion under differential heating and cooling. Equations are developed and then expressed in general terms applicable to the whole atmosphere regarded as a closed system. Results are compared with those of MARGULES. Among the corollaries is that positive primary sources of kinetic energy must always occur in combination with sinks. The sources are regions of horizontal divergence, i.e., anticyclones, especially in tropics, whence kinetic energy flows polewards. Analysis is then extended to global balance of total energy and the magnitude of the various contributions to poleward transfer (ocean currents, latent heat and the probably small effect of mean meridional circulation). These give a rough balance. *Subject Headings:* **1. Energy equations 2. General circulation.**—*C.E.P.B.*

3.5–11 551.584:551.588.7(485)

*Sundborg, Åke, **Climatological studies in Uppsala, with special regard to the temperature conditions in the urban area.** *Uppsala, Universitet, Geografiska Institutionen, Geographica,* No. 22, **1951.** 111 p. graphs, charts, biblio. **DLC**—This monograph on the climate of Uppsala can serve as a model for investigations of urban microclimatology. It contains a brief survey of the literature of urban climatology, in particular the effect of cities upon radiation, atmospheric temperature and humidity, wind and precipitation; a description of the topography, settlement and vegetation and an analysis of the overall climate of Uppsala. Data on mean hourly and monthly temperatures, absolute humidity and wind velocity and isopleth diagrams of these variables and of total radiation (using data for Stocksund) are given. The resistance thermometer for measuring temperature, its calibration and its installation on

the automobile are described and the method of selecting representative observation points and the procedure for taking observations are discussed. Isotherm charts, showing temperature distribution within Uppsala for specific weather conditions and temperature profiles along the traverse for special weather conditions, are given. The relationship between temperature differences and simple climatological elements, especially cloudiness and wind, is analyzed by means of partial correlation and a theoretical analysis of the physical basis of the temperature difference between the inhabited area of the city and the open countryside is presented. *Subject Headings:* **1. Microclimatology 2. Urban climates 3. Climatic data 4. Uppsala, Sweden.**—*I.L.D.*

3.5–12 551.511 551.551

†Sutton, O. G., **Atmospheric turbulence and diffusion.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 492–509. 80 refs., numerous equations.) **MH-BH, DWB**—A critical summary of the literature and remarks about remaining difficulties. After describing the nature of turbulent flow, the mathematical treatment is developed and the constants u, A, K, μ, ν, l defined. Velocity profiles near smooth and rough surfaces are analyzed and roughness length Z_0 defined. Statistical theories of turbulence (TAYLOR, KOLMOGOROV, etc.) are set out. The physical features of local, large scale and planetary turbulence as shown in fields of temperature, velocity, vapor pressure and momentum are summarized; wind profiles (including Ekman spiral), variations of eddy conductivity and diffusivity and height variations of K are discussed. Research on small scale diffusion and evaporation problems is described. RICHARDSON's criterion, effect of density gradient and problems of convection are discussed. *Subject Headings:* **1. Eddy diffusion 2. Evaporation theory 3. Atmospheric turbulence.**—*C.E.P.B.*

3.5–13 551.515.23(729,75)

Tannehill, Ivan Ray, **Hurricanes. Their nature and history, particularly those of the West Indies and the southern coasts of the United States.** 7th ed. Princeton, Princeton University Press, **1950.** 304 p. charts, diagrs., photos, append., biblio. **DWB**—TANNEHILL's classic study of tropical hurricanes is brought up to date by the inclusion of an appendix in which radar, aircraft reconnaissance, microseisms, automatic weather stations and sferics are discussed in relation to hurricane observing and forecasting. The latest precautionary methods are listed, the 1945–1949 hurricane seasons reviewed and the bibliography enlarged by the addition of recent contributions. The body of the book remains the same as earlier editions, consisting of fifteen chapters on such subjects as winds, storm waves, hurricane genesis, tracks, and historical accounts of memorable hurricanes. *Subject Headings:* **1. Hurricanes 2. Tropical meteorology 3. West Indies 4. Atlantic States.**—*M.P.K.*

3.5–14 551.515.7

†Wexler, Harry, **Anticyclones.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 621–629. fig. 38 refs.) **DWB**—Anticyclones are shallow cold polar (due to surface cooling) or deep with warm troposphere and cold stratosphere. A few combine cold troposphere and cold stratosphere. Possible causes of warm type are: radiative cooling of stratosphere (improbable); advection of cold stratosphere air (secondary factor); dynamic, either by cutting off ridges in low index westerly flow (blocking) or by mass convergence of cross isobaric winds. Author favors a combination of factors, especially stability and surface cold air. Structure (subsidence inversion) and forecasting motion (acc. ROSSBY) of a polar anticyclone and transformation into a dynamic type discussed. Anticyclonic weather briefly examined, including summer showers and Indian summer. Unusual anticyclone of Dec. 23–26, 1949, analyzed. *Subject Heading:* **1. Anticyclones.**—*C.E.P.B.*

GENERAL METEOROLOGY

3.5–15 551.5:06(09)(439.1)

Aujeszky, László, **Les activités météorologiques en Hongrie.** [Meteorological activities in Hungary.] *International Union of Geodesy and Geophysics, Association of Meteorology,*

Oslo, 1948, Procès-Verbaux, 3:151–158, Nov. 1950. 74 refs. In French. **DWB**—The main institutes which sponsor meteorological research in Hungary are listed with a brief review of work done during the war years by these institutes in several fields: instruments, synoptic meteorology, singularities, long range forecasting, aerology, climatology, climatic changes, agricultural meteorology, radio meteorology, history and development in meteorology. A long list of references without titles is given. *Subject Headings:* **1. Meteorological services 2. Meteorological research 3. Hungary.**—*M.R.*

3.5–16 551.5:06

Bleeker, Wouter, **International vergaderingen.** [International conferences.] *Hemel en Dampkring*, 49(11):194–195, 1951. **DLC**—Note on the Paris conference of Directors of I.M.O. (March 15–April 28, 1951) which led to the dissolution of I.M.O. and the organization of the World Meteorological Organization, together with a brief history of the I.M.O. and the relationship of W.M.O. to the United Nations. A list of the eight presidents of Commissions is given and a summary of some of the problems considered at the Paris meeting. Among the latter was the new location of the Secretariat at Geneva, the advisability of establishing an International Scientific Institute (Rossby plan) and the relationship of W.M.O. to other international organizations. *Subject Headings:* **1. World Meteorological Organization 2. International Meteorological Organization 3. International organizations.**—*M.R.*

3.5–17 551.5:06(058)(676)

East Africa. High Commission, Meteorological Dept., **East African Meteorological Department Annual Report, 1950.** Nairobi, English Press, Ltd., [1951]. 25 p. **DWB**—The primary functions of the East African Meteorological Department, especially the Forecast Service, Climatological Service and research activities, are outlined. The administration of the various departments such as the library, printing section, Central Forecast Office, desert locust survey, electronics section, training school, etc. and the research projects on rainfall intensity, rain making, sferics, effect of forests on rainfall, etc. are reviewed. An elaborate 3-color flight forecast chart for the route from Eastleigh to Johannesburg is presented. Areas where cloud tops are above the freezing level are colored in red –below freezing level in green. Hail and turbulence, thunderstorm clouds, ceiling and other airways information also shown. *Subject Headings:* **1. Meteorological services 2. Flight forecasts 3. Annual reports 4. East Africa. High Commission. Meteorological Dept. 5. British East Africa.**—*M.R.*

3.5–18 551.5(09):06:016(73/9)

†Byers, Horace R. and Baum, Werner A., **Meteorological research in the United States 1939–1948.** *International Union of Geodesy and Geophysics, Association of Meteorology, Oslo, 1948, Procès-Verbaux*, 3:11–79, Nov. 1950. biblio. p. 57–79. In English. **DWB**—A most comprehensive summary of advances in every field of meteorology and climatology for the war and post-war years, with comments on each special field and appended bibliographic references. The work of the various universities, the military services and the U. S. Weather Bureau are shown in true perspective. At least 500 works are mentioned and many of them reviewed. *Subject Headings:* **1. Progress in meteorology 2. Meteorological research 3. Bibliographies 4. United States.**—*M.R.*

3.5–19 551.5:06(09)(438)

Gumiński, R., **Rapport de la Section de Météorologie pour la période 1939–1948 redigé pour l'Association Internationale de Météorologie.** [Report of the section of meteorology for the period 1939–1948 prepared for the International Meteorological Association.] *International Union of Geodesy and Geophysics, Association of Meteorology, Oslo 1948, Procès-Verbaux*, 3:194–196, Nov. 1950. In French. **DWB**—Report on research or development in Poland from 1945–1947 in fields of aerology, climatology, atmospheric optics and electricity, agricultural meteorology, synoptic meteorology and microclimatology. The entire Polish network was destroyed during the war and 24 of the meteorologists killed. A number of manuals have been written for the reorganized service. *Subject Headings:* **1. Meteorological services 2. Meteorological research 3. Poland.**—*M.R.*

3.5–20 551.5:06(43)

Schneider-Carius, Karl (*Bad Kissingen*), **Bericht über die Tagung der Meteorologischen Gesellschaft in Bad Kissingen vom 12. bis 15. Oktober 1951.** [Report on the meeting of the Meteorological Society in Bad Kissingen Oct. 12–15, 1951.] *Geofisica Pura e Applicata*, 20:209–211, July–Dec. **1951. MH-BH**—The essential features of about 50 papers read at the Oct. 1951 meeting of the German Meteorological Society in Bad Kissingen are briefly mentioned. Papers are classified into six major groups: 1) broad-scale weather studies and medium range forecasting; 2) dynamics of the atmosphere; 3) evaporation; 4) atmospheric electricity and ionosphere; 5) aerosols, bioclimatology and local climates; 6) instruments and measuring techniques. Dr. L. Weickmann presided; three hundred and forty-four meteorologists attended. *Subject Headings:* **1. Conferences 2. German Meteorological Society 3. Bad Kissingen, Germany. I. Weickmann, L.**—*M.R.*

3.5–21 551.5:06(43)

van Eimern, Josef, **Tagung der Meteorologischen Gesellschaft in Bad Kissingen vom 12. bis 15. Oktober 1951.** [Meeting of the Meteorological Society in Bad Kissingen Oct. 12–15, 1951.] *Erdkunde*, Bonn, 6(1):50–51, Feb. **1952. DLC**—Brief summaries of the papers. *Subject Heading:* **1. Conferences.**

3.5–22 551.5:550.3:06(04)

†American Geophysical Union, **Alphabetical and geographical lists of members; List of committees; List of publications.** *American Geophysical Union, Transactions*, 31(5), Pt. 2, Oct. **1950.** 116 p. **MH-BH**—Names and addresses of members as of September 10, 1950 are listed alphabetically and also by country, state and city or town in each state. The numerical increase in membership from approximately 45 in 1921 to almost 4700 in 1950 is represented in a graph with indication of dates of gradual increase in annual dues. The list of committees includes names of their members. A complete price list of available publications of the American Geophysical Union from 1920 to 1950 is added. *Subject Headings:* **1. American Geophysical Union 2. Membership lists 3. Publication lists.** *-G.T.*

3.5–23 551.5:550.3:06(04)

†American Geophysical Union, **Index to Transactions, years 1920–1944 inclusive.** Washington, D. C., National Research Council, Nov. **1951.** 144 p. Price **$4.00. MH-BH**—Authors and abbreviated titles as well as many subjects are listed in a combined alphabetical index for the first 25 years of the *Transactions*, with reference to volume and pages of publication. A complete price list of available *Transactions* and other publications of the American Geophysical Union from 1920 to November 15, 1951 is added. *Subject Headings:* **1. American Geophysical Union 2. Cumulative indexes 3. Bibliographies.** *G.T.*

3.5–24 551.5:629.13

Robson, R. C., **All-weather flying; impressions of the All-Weather Flying Symposium, Electronics, 2nd session, I.A.S. Nineteenth Annual Meeting.** *Aeronautical Engineering Review*, 10(5):44–47, 173, May **1951.** photos, diagr. **DLC**—Details of the adaptation of electronic and visual approach signals to poor visibility conditions are discussed. Ground icing from freezing rain and turbulence are pointed out as two major problems in aviation. A drawing of a suggested runway marking layout is presented. Photographs show the author and members of the All-Weather Flying Symposium panel. *Subject Headings:* **1. All-weather flying 2. Aircraft landing aids 3. Aeronautical meteorology.**—*G.T.*

3.5–25 551.5:632.187

Kashin, K. I. and Gritsenko, M. V., **Lesnye pozhary vo Frantsii.** [Forest fires in France.] *Meteorologiia i Gidrologiia*, No. 3:14–19, Nov. **1950.** 2 figs., 3 tables. **DLC**—The synoptic conditions over western Europe and in particular over southwestern France for the period June–Aug. 1949, during which extensive forest fires occurred, are described. The persistent anticyclonic conditions with the accompanying high temperature favored continuous drought.

Tables of 1300 hr air temperature, dew point and mean increase of fire hazard index per day (scale of V. G. NESTEROV) for several localities are given. *Subject Headings:* **1. Forest fires 2. Fire weather 3. France.**—*I.L.D.*

3.5–26 551.5:92

Budyko, M. I., **Vydaiushchiïsia russkiĭ meteorolog V. N. Karazin.** [The famous Russian meteorologist V. N. Karazin.] *Meteorologiia i Gidrologiia*, No. 4:3–9, Dec. **1950.** refs. **DLC**—A biographical article and a survey of V. N. KARAZIN's activity in meteorology and his writings on meteorological subjects. The idea of organizing a central meteorological establishment with a net of stations operating uniformly was advanced by KARAZIN as early as 1818. *Subject Headings:* **1. Biography 2. History of meteorology 3. Karazin, Vasiliĭ Nazarovich.**—*A.M.P.*

3.5–27 551.5:92(08):06

Fleming, Richard H., **Thirteenth award of the William Bowie medal. Citation.** *American Geophysical Union, Transactions*, 32(3):337–340, June **1951.** photo. **DWB**—In this citation, FLEMING clearly indicates why DR. HARALD ULRIK SVERDRUP was unanimously chosen to receive the William Bowie medal awarded annually by the American Geophysical Union for "distinguished attainment and outstanding contribution to the advancement of cooperative research in fundamental geophysics." SVERDRUP's letter of acceptance is included. DR. SVERDRUP is recognized as an outstanding oceanographer, meteorologist, geophysicist and polar explorer. His major publications are briefly mentioned. *Subject Headings:* **1. Sverdrup, Harald Ulrik 2. Citations. I. American Geophysical Union. William Bowie medal.**—*M.P.K.*

3.5–28 551.5:92:06(73/9)

U. S. Weather Bureau, **The cooperative weather observer.** Washington, D. C., Govt. Print., **1951.** 201 p. photos. **DWB**—A substantial volume giving biographical information on about 600 cooperative observers who have served without pay for 20 or more years and the names of about 1000 with 10 to 20 years service in the 48 states of the United States and in Alaska, Hawaii, Puerto Rico, Haiti and the Virgin Islands, etc. Photographs of over 60 observers with 40 or more years of service are included. One man, WILLIAM C. HARRIS of Dover, N. J., began keeping records in 1879 and did not retire until 1945. *Subject Headings:* **1. Cooperative observers 2. Biography 3. U. S. Weather Bureau.**—*M.R.*

3.5–29 551.5(09)(05)(471.1)

Väisälä, Vilho, **National report on meteorological research in Finland 1939–1948.** *International Union of Geodesy and Geophysics, Association of Meteorology, Oslo, 1948, Procès-Verbaux*, 3:80–83, Nov. **1950.** In English. **DWB** Statistics on the number of stations in Finland at the end of 1947 are given. Abstracts of literature published in Finland from 1935–1944 were presented in *Geophysica*, 2, (1947) and material published from 1945–1948 in *Geophysica*, 4, (1949). Important investigations during the war years in climatology, aerology, synoptic meteorology and agricultural meteorology are reviewed briefly. *Subject Headings:* **1. Meteorological networks 2. Meteorological research 3. Finland.**—*M.R.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

(*See also items:* 3.5–62, 3.5–76, 3.5–168, 3.5–174, 3.5–206, 3.5–242)

3.5–30 551.501(09)(931)

Robertson, N. G., **The organization and development of weather observations in New Zealand.** (In: Garnier, B. J., (*ed.*), **New Zealand weather and climate.** Christchurch, New Zealand, Whitcomb and Tombs, **1950.** p. 7–25. refs.) **DLC**—Reports from nearly a thousand observation stations in New Zealand and Fiji Islands are received regularly by the New Zealand Government. Stations are divided into 3 classes: 1) synoptic (108), 2) climato-

logical (102) and 3) rainfall (670). Locations of stations in each class are shown on separate maps, including designations for pilot balloon, radiosonde and rawinsonde, offices and other sub-categories, and a description is given of the development of networks for each class of station. The first records were made in Auckland (1840) and Wellington (1841), but it was not until 1853–56 that any were published. In 1861 a network of 10 official observatories (with a central office and director) was inaugurated. Forecast service began in 1874 with a storm warning service (mainly for shipping) and in 1880 rainfall stations were established. Pilot balloons were first used in 1929 and radiosondes in 1942 (14 were released at Wellington in 1934 by HOLMBOE of Ellsworth Antarctic Expedition). Other activities are described and publications of the service listed. *Subject Headings:* **1. New Zealand Meteorological Service 2. Meteorological networks 3. History of meteorology.**—*M.R.*

3.5–31 551.501:551.571:551.508.71

Vorob'ev, I. E., **K voprosu metodiki meteorologicheskikh nabliudenii na pustynnykh stantsiiakh.** [On the methodology of meteorological observations at desert stations.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):66–77, **1951.** 4 figs., 11 tables, 2 refs. **DLC**—This article describes an experimental design to test the applicability to desert conditions of accepted methods used in the U.S.S.R. for measuring atmospheric relative humidity. Tests were carried out to determine the precision of measurements of relative humidity, and observations made with an aspirated psychrometer and a psychrometer in a shelter were compared. The applicability of the International Cloud Atlas at desert stations is discussed. *Subject Headings:* **1. Humidity measurement techniques 2. Desert meteorological stations 3. Psychrometers 4. Instrument comparisons 5. International Cloud Atlas.** —*I.L.D.*

3.5–32 551.501:551.571:551.508.71

†Wexler, Arnold and Brombacher, W. G., **Methods of measuring humidity and testing hygrometers.** *U. S. National Bureau of Standards, Circular 512*, Sept. 28, **1951.** 17 p. tables, refs. **DWB**—This paper is a review of methods for the measurement of the water vapor content of air and other gases and for the production and control of atmospheres of known humidity for hygrometer testing and calibration and for general research. Among the hygrometric techniques discussed are psychrometry, mechanical hygrometry, dew point measurement, electric hygrometry, gravimetric hygrometry, thermal conductivity, index of refraction, pressure and volume measurements, and dielectric constant. Descriptions are given of suitable equipment for establishing desired humidities over a wide range of temperature. A list of 157 selected references pertaining to hygrometry is included. *Subject Headings:* **1. Humidity instruments 2. Hygrometry.** —*Authors' abstract.*

3.5–33 551.501.42:551.508.41

Sneyers, Raymond, **De la correction thermique du baromètre à cuvette et à échelle fixes.** [On the temperature correction of the barometer with fixed reservoir and scale.] *Belgium, Institut Royal Météorologique, Miscellanées*, 37, **1951.** 16 p., 9 refs., equations. **MH-BH**—Discusses various historical formulas for correction of two types of barometer, one with a linear metric scale and the other reduced for area of reservoir. A new general formula is constructed (eq. 15) and the constants determined for two Fuess barometers. Finally, a simplified formula is developed which can be used with correction tables to 0°C for Fortin barometers. *Subject Headings:* **1. Barometer reduction 2. Constants.**—*C.E.P.B.*

3.5–34 551.501.45:551.521.3

Schmidt, Karl-Heinz, **Prüfung der Strahlungsrechendiagramme von Möller und Elsasser durch Gegenstrahlungsmessungen bei gleichzeitig durchgeführten Radiosondenaufstiegen.** [Checking the radiation computing diagrams of Möller and Elsasser by counter radiation measurements with synchronous radiosonde ascents.] *Zeitschrift für Meteorologie*, 5(11):331–340, Nov. **1951.** 6 figs., 18 refs. **MH-BH**—Observations with a Falckenberg pyranometer were made at Greifswald during radiosonde ascents (clear and cloudy weather), expressed as ratio K to black body radiation at same temperature and compared with values from the

(1) Elsasser, (2) Möller diagrams, (3) Ångström's formula with his constants and (4) with those of Bolz and Falckenberg. Errors of calculated values are up to 10% and are attributed in (1) to over-estimate of emission of water vapor at small wave-lengths, (2) to too small emission of long waves (correction formulas are devised), (3) is too low, (4) fits well with a mean error of 2.7%, but gives values too low by an amount proportional to ground inversion. Control measurements were made at Warnemünde. *Subject Heading:* **1. Radiation calculations.**—*C.E.P.B.*

3.5–35 551.501.45:551.571:518.3

Schuster, M., **Psychrometer-Nomogramme.** [Psychrometer nomograms.] *Zeitschrift für Meteorologie*, 5(12):353–358, Dec. **1951.** 2 figs., 2 tables, 6 refs. **DWB**—Author reviews previous types of dry and wet bulb nomograms and slide rules and then describes construction of a new nomogram based on table of Holborn, Scheel and Hennig (1919). A movable arm graduated for dry bulb (°C) swings in a sector of a circle until dry bulb coincides with wet bulb. Relative humidity, vapor pressure and dew point can be read off directly. *Subject Headings:* **1. Humidity diagrams 2. Nomograms.**—*C.E.P.B.*

3.5–36 551.501.45:551.509.5:37

Widger, William K., Jr. and Palmer, Thomas Y., **A method for using International Business Machines test sheets for student forecasting and verification.** *American Meteorological Society, Bulletin*, 32(8):298-301, Oct. **1951.** fig., 2 tables, 2 refs. **MH-BH**—The authors, who represent the Dept. of Agronomy, Cornell University, Ithaca, N. Y., explain a simplified way of preparing and grading students' forecast tests by using I.B.M. form I.T.S. 1100 A 151 in conjunction with an I.B.M. test scoring machine. Photographs of a portion of the I.B.M. form and of the scoring machine are presented. The six elements on which data are requested from the students, with 4–15 options on each element, are shown in a table. A table for the penalty system applied is added. *Subject Headings:* **1. Punched card methods 2. Forecast verification 3. Teaching of meteorology.**—*G.T.*

3.5–37 551.501.6/7

Troian, I. K., **Grafik-interpoliator skorosti i napravleniia vetra dlia standartnykh vysot.** [Graphic interpolation of the speed and direction of the wind for standard heights.] *Meteorologiia i Gidrologiia*, No. 2:51–52, Oct. **1950.** fig. **DLC**—A description of an auxiliary computation device which has on the vertical scale the altitude (1mm:10m), and on the horizontal, the wind velocity and wind direction. Examples of its use are given. *Subject Headings:* **1. Computation charts 2. Graphic interpolation 3. Upper air wind analysis.**—*N.T.Z.*

3.5–38 551.501.8:551.590.25:523.5

McKinley, D. W. R. (*Ottawa, Canada*), **Variation of meteor echo rates with radar system parameters.** *Canadian Journal of Physics*, 29(5):403–426, Sept. **1951.** diagrs., graphs, tables, refs. **DWB**—Description and discussion of the experiments on meteoric echo observations by radar that have been conducted at Ottawa, Canada, since the summer of 1947 on 9.2, 5.4 and 2.8 wave lengths with various transmitter powers and antenna systems. The results support Lovell's scattering formula. The following was observed: 1) a decrease of detectable echoes with decreased wave lengths and 2) a distinct difference between the size distribution of strong shower meteors and that of the normal background meteors. *Subject Headings:* **1. Meteor echoes 2. Microwave propagation 3. Radar echoes 4. Ottawa, Canada.**—*W.N.*

3.5–39 551.501.8:551.594.7:621.396.9

Maynard, R. H. **RADAR-Meteorologie.** [Radar-meteorology.] *Umschau*, Frankfurt, a.M., 50(16):504–506, Aug. **1950.** 5 figs., ref. **DLC**—Basic principles of meteorological radar measurement are explained and patterns on the radar screen which show different shapes indicating echoes from showers, storms, fronts or typhoons are described. Three radar screen photographs representing echoes from a thunderstorm, a cold front and a typhoon are reproduced. Measuring and control equipment used by U. S. Navy Weather Service are shown

on two photographs. *Subject Headings:* **1. Radar meteorology 2. Radar echoes 3. Radar storm detection 4. Radar photographs.**—*G.T.*

3.5–40 551.501.81:551.515.13:551.515.8

Austin, Pauline M., **Radar observations of a frontal storm.** *American Meteorological Society, Bulletin*, 32(4):136–145, April **1951.** diagrs., photos, 6 refs. **MH-BH**—The structure of the frontal storm that passed across New England, Feb. 13–14, 1948 and the development of frontal precipitation is investigated by means of continuous time sequence photographs from a single radar installation. The general weather situation is illustrated by synoptic maps and with the aid of radar scope photographs. The author discusses the typical sequence of radar observations corresponding to warm front precipitation, the layer aloft, characteristics of precipitation following layer structure, the repetition of warm front sequence and the precipitation associated with the cold front. *Subject Headings:* **1. Radar storm detection 2. Frontal storms 3. Air masses.**—*I.L.D.*

3.5–41 551.501.81:551.515.2

Jorgensen, R. C. and Gerdes, W. F., **The Dow Chemical Company leads industry in using radar for hurricane detection.** *American Meteorological Society, Bulletin*, 32(6):221–224, June **1951.** 3 figs. **MH-BH**—A description of the radar unit used in the hurricane detection program and illustrations of the apparatus are given. The general method of hurricane detection by means of radar is discussed briefly. *Subject Headings:* **1. Radar storm detection 2. Hurricanes.**—*I.L.D.*

3.5–42 551.501.81

Miles, V. G., **Radar and bright-band cloud echoes in Southern Rhodesia.** *Meteorological Magazine*, London, 80(954):364–365, Dec. **1951.** 3 photos. **MH-BH**—Describes observations of bright band echoes with radar beam vertical, generally about 9000 ft. Photographs show echo bands on P.P.I. *Subject Headings:* **1. Bright band echoes 2. Radar observation 3. Radar photographs.**—*C.E.P.B.*

3.5–43 551.501.9:551.585.7(09)(433)

Cena, G., **Il cinquantenario della fondazione dell'Osservatorio di montagna della Zugspitze, la vetta piu elevata della Germania.** [The 50th anniversary of the founding of the Zugspitze Mountain Observatory, the highest summit of Germany.] *Rivista di Meteorologia Aeronautica*, 11(1):53–57, Jan.–March **1951. MH-BH**—On Sept. 18, 1950, 350 people attended this celebration held in the U. S. Zone of Germany at Garmisch-Partenkirchen at the foot of the Zugspitze. Prof. L. Weickmann presided, and Barnett, Hagen, Col. Chavasse from the U. S. A., Dr. von Ficker and other notables were present. The equipment, history of station and observations of different elements at Zugspitze (2962 m) are briefly reviewed. Visibility up to 245 km is possible. Finally, the excursion to the summit and papers read there are mentioned and problems of mountain meteorology outlined. *Subject Headings:* **1. Mountain meteorology 2. Conventions 3. Zugspitze Observatory 4. Germany.**—*M.R.*

3.5–44 551.501.9:37

U. S. Weather Bureau, **Silver Hill Observatory; first year of operation.** Washington, D. C., Nov. **1951.** 17 p. 7 figs. **DWB**—The establishment of the Silver Hill Aerological Station in the outskirts of Washington, D. C. (10 miles southeast of the Central Office of the U. S. Weather Bureau) during 1949 and 1950 is described. Radiosonde and pilot balloon observations were transferred to Silver Hill from Washington National Airport during Oct. 1950. The station is under the general supervision of B. C. Haynes and is used for testing many types of aerological and surface observational equipment. Among the projects described are: 1) experimental balloon testing, 2) radiosonde testing in flight, 3) testing hygrometers, plotting boards and other special equipment and 4) training of personnel (names listed). Good photographs of the site and equipment are appended. *Subject Headings:* **1. Silver Hill Observatory 2. Aerological stations 3. Radiosonde flight testing 4. Training in meteorology 5. Observational equipment. I. Haynes, Benarthur C.**—*M.R.*

OBSERVATIONAL DATA

(*See also items:* 3.5–164, 3.5–194, 3.5–202, 3.5–208, 3.5–238, 3.5–241)

3.5–45 551.506.1(729.9)

*Bermuda. Meteorological Office, **Summary of observations, 1950.** [Hamilton] Aug. **1951.** 121 p. mostly tables. **DWB**—Coordinates and elevations of instruments given for five stations of Bermuda. Data are presented *in extenso* for Hamilton and Saint George, including hourly and daily values of pressure, temperature, wind, sunshine and rainfall, and monthly and annual summaries of all weather conditions observed. Elaborate frequency tables of some of the elements are also included. *Subject Headings:* **1. Observational data 2. Annual reports 3. Bermuda.**—*M.R.*

3.5–46 551.506.1:551.582.2(728.4)

*El Salvador. Observatorio Nacional Meteorológico, **Anales . . . 1950.** [Annual . . . 1950.] [San Salvador] Imprenta Nacional, **1951.** 123 p. all tables. **DWB**—The data for 1950 include: annual summaries of temperature, humidity and rainfall and monthly summaries of temperature, humidity, vapor pressure, cloudiness, wind direction and velocity, rainfall and evaporation for a number of stations; daily or thrice-daily observations of the above elements for the Observatorio Nacional only. Additional data for this observatory are annual averages of the principal meteorological elements for the period 1912–1950. Geographic coordinates and heights of all stations are given. *Subject Headings:* **1. Climatic data 2. Annual reports 3. El Salvador. I. El Salvador. Ministerio de Cultura Popular.**—*M.L.R.*

3.5–47 551.506.1:551.577.2(431/5)

*Germany. Deutsche Demokratische Republik. Meteorologischer Dienst, **Deutsches Meteorologisches Jahrbuch, 1950, Teil III, Niderschlagsbeobachtungen.** [German Meteorological Yearbook, 1950, Pt. 3, Precipitation observations.] Berlin, Deutscher Zentralverlag, **1951.** 220 p. charts, mostly tables. **DWB**—Daily observations of precipitation for each month of 1950 at >1200 stations and daily snow depth and water content of snow for Jan.–March and Oct.–Dec. 1950; monthly and annual means and extremes and percentage of 40 year average days of excessive or long period rainfall. Station location table is arranged by districts (Mecklenburg, Brandenburg, Berlin, Saxony, Thuringia) and gives length of record at each station. Numerous charts included. *Subject Headings:* **1. Observational data 2. Precipitation data 3. Snowfall data 4. Yearbooks 5. East Germany.**—*M.R.*

3.5–48 551.506.1:551.582.2(469)

*Portugal. Serviço Meteorológico Nacional, **Anuário climatológico de Portugal. Continente e ilhas de Atlântico-Norte, Vol. 1—Año de 1947.** [Climatological annual for Portugal. The continent and islands of the North Atlantic. Vol. 1—Year 1947.] Lisbon, **1949.** 136 p. entirely tables. **DWB**—Tables include the following: 1) thrice-daily observations (9, 15 and 21 h) of pressure, temperature, relative humidity, wind direction and velocity, cloudiness and daily observations of visibility, insolation and precipitation (9 h–9 h) for 9 stations; 2) monthly summaries of pressure, mean, maximum and minimum temperature, wind from 8 directions, relative humidity, cloudiness, insolation, precipitation and days with various hydrometeors for approximately 95 stations and 3) monthly totals of rainfall, maximum rainfall and number of days with rainfall for more than 400 rain gage stations. Geographic coordinates and altitude given for all stations. *Subject Headings:* **1. Climate data 2. Annual reports 3. Portugal.**—*M.L.R.*

3.5–49 551.506.1:551.582.2(87)

*Venezuela. Servicio de Meteorología y Communicaciones, **Boletín Bimestral.** First issue received: Año 1, No. 1, Jan./Feb. 1950; latest issue received Año 2, No. 10, July/Aug. 1951. Maracay, **1950–1951.** paging varies. all tables. **DWB**—No. 1 of v. I lists 13 synoptic meteorological stations and 8 climatological stations with their location as to state, geographic coordinates and altitude. Thrice-daily observations of temperature, humidity and pressure; daily observation of rainfall, insolation and wind from 16 directions, and days with

cloudiness, wind storms, dust storms, rainfall, light rain, fog, mist, snow, hail, dew and hoar-frost are shown tabularly for each month. Airways climatic data are presented according to the International Code for frequencies of low clouds simultaneously with horizontal visibility and height of the base of the lowest clouds. *Subject Headings:* **1. Climatic data 2. Airways data 3. Venezuela. I. Venezuela. Ministerio de la Defensa. Fuerza Aérea Venezolana.**—*M.L.R.*

3.5–50 551.506.1(497.1)

*Yugoslavia. Hidrometeorološka Služba, **Mesečni Meteorološki Izveštaj. Godina III, Broj 1–6, siječanj–juni, 1951.** [Monthly Meteorological Bulletin, 3(1–6), Jan.–June 1951.] Belgrade, **1951.** tables. In Croatian. **DWB**—The January number of this bulletin contains a list of 160 stations classified as to I, II, III or IV order with their geographic coordinates and heights. Tables include daily observations of the usual meteorological elements for 10 stations and monthly summaries for each of the 160 stations. *Subject Headings:* **1. Climatic data 2. Monthly weather reports 3. Yugoslavia.**—*M.L.R.*

3.5–51 551.506.2(677)

*Bossolasco, Mario (*ed.*), **Osservazioni meteorologiche ed aerologiche eseguite nella Stazione Geofisico di Mogadiscio.** [Meteorological and aerological observations kept at the Mogadiscio Geophysical Station.] Milan, Istituto Geofisico Italiano, [pref. 1950]. 2 V. v. 1. entirely tables. 24 refs. Preface in Italian and English. **DWB**—Author describes the part played by Italy in the second International Polar Year (Aug. 1932–July 1933), namely the establishment of a temporary Geophysical Station in Mogadiscio where 4 times daily surface observations and pilot balloon runs were kept. The difficulties encountered in publishing results are mentioned. The first part contains extensive tables of bi-hourly atmospheric pressure, temperature, relative humidity, cloudiness, visibility, sky blueness and sea temperature, and hourly surface winds, maximum and minimum temperatures, sunshine duration, precipitation, evaporation, soil temperatures to depths of 7, 15, 30 and 75 cm, global radiation and cloud observations. Part 2 gives detailed 3–4 times daily pilot balloon observations for the period. *Subject Headings:* **1. International Polar Year 2. Observational data 3. Upper air wind data 4. Sea temperature data 5. Soil temperature data 6. Mogadiscio, Italian Somaliland. I. Mogadiscio, Italian Somaliland, Stazione Geofisico II. Istituto Geofisico Italiano, Milan III. Secondo Anno Polar Internazionale, 1932–33, Participazione Italiana.**—*M.R.*

3.5–52 551.506.5:551.506.7(99)

*§Gibbs, W. J., Gotley, A. V. and Martin, A. R., **Heard and Macquarie Islands, 1948. Part I (a), Results; Part I (b), Analyzed charts.** *Australian National Antarctic Research Expedition, A.N.A.R.E. Reports, Series D*, v. I, Pts. I (a) and I (b), Oct. **1950,** and Oct. **1951.** 2 v. tables, charts. **DWB**—First part of this report includes results of observations made at Heard and Macquarie Islands during 1948, printed from Hollerith cards. Tables contain data on pressure, temperature, dew point depression, surface wind direction and speed, maximum wind, daily precipitation, sunshine duration, temperature at 850, 700, 500, 300, 200, 100 mb and tropopause; pressure and geopotential of tropopause; actual surface, pilot balloon and radiosonde observations. Observers are listed and codes explained in detail. The second volume of Pt. I contains analyzed charts of the Antarctic for each day of June and Dec. 1948. The Dec. 1948 charts cover a much broader area than the June. *Subject Headings:* **1. Observational data 2. Synoptic charts 3. Aerological data 4. Radiosonde data 5. Heard Island 6. Macquarie Island 7. Antarctica. I. Australia. Dept. of External Affairs. Antarctic Division II. Australian National Antarctic Research Expedition, 1947–1949 III. Law, Phillip G. (*ed.*).**—*M.R.*

3.5–53 551.506.7:551.547(931)

Barnett, M. A. F., **Mean circulation at high levels over New Zealand.** *Journal of Meteorology*, 8(3):202, June **1951.** refs., table. **DWB**—A table of the mean heights of the 60 mb surface for each month at Auckland and Hokitika is presented. The data indicate that the wind is predominantly easterly in Dec. and Jan. but that westerlies prevail in other months. *Subject Headings:* **1. Upper air observation 2. General circulation 3. Wind regime 4. Auckland, New Zealand 5. Hokitika, New Zealand.**—*I.L.D.*

INSTRUMENTS

(*See also items:* 3.5–31 to 3.5–33, 3.5–67, 3.5–112, 3.5–119, 3.5–122, 3.5–144, 3.5–187, 3.5–190, 3.5–216, 3.5–219, 3.5–230, 3.5–277)

3.5–54 551.508

Bellamy, John C., **Instruments for upper atmosphere and interplanetary navigation.** *Navigation*, Los Angeles, 2(8):272–275, Dec. 1950. **MH-BH**—Speculations are made as to type of craft suitable for interplanetary travel (a spinning disk or saucer) and the methods which might be used to measure velocity, position, acceleration, time, etc. and for making calculations. Döppler spectroscopic measurements would give velocities; radar, Loran, crystal chronometers and electronic computers would be useful in space flights. *Subject Headings:* **1. Interplanetary flights 2. Flying saucers 3. Instruments for space flight.**—*M.R.*

3.5–55 551.508.21

Georgi, Johannes, **Abschirmung eines Pyranometers gegen direkte Sonnenstrahlung.** [The shielding of a pyranometer against direct solar radiation.] *Geofisica Pura e Applicata*, 20:62–66, July–Dec. 1951. fig. In German, German and English summaries p. 62. **MH-BH**—A chart is presented to show the relative size and inclination of a screen that would be necessary for shielding a Robitzsch actinometer from the direct solar radiation when attempting to record sky radiation with solar angle of 90°, 30° and 10° respectively. The calculations are made on the assumption that the shield will cover a radius of 5° from the center of the sun's disc. *Subject Headings:* **1. Actinometer shields 2. Sky radiation 3. Robitzsch pyranometer.**—*M.R.*

3.5–56 551.508.21

MacDonald, Torrence H., **Some characteristics of the Eppley pyrheliometer.** *Monthly Weather Review*, 79(8):153–159, Aug. 1951. 10 figs., 4 tables, 9 refs., 4 equations. **DWB**—Laboratory tests were made of the Eppley pyrheliometer under varying exposures in order to determine accuracy when used in an airplane which varies its plane with respect to the earth's surface, and often encounters rapid temperature changes and heavy precipitation in flight. Test equipment is described and illustrated. Temperature tests on 7 pyrheliometers from 120° to −40°F show a consistent decrease in response at higher temperatures although some instruments showed only one-third the variation that others did. It was thought that cause was that at low temperatures the difference in temperature between the 2 elements is greater than at high temperatures. Cosine response tests showed only slight errors with changing angle of incidence. No effect was noted when the instrument was mounted in an inverted position, but a 5% decrease in output occurred when mounted vertically—probably due to convection currents inside the globe. Temperature tests show no difference between horizontal and vertical positions of pyrheliometers. No change in output was noted when the globe was covered with water drops, although variations of much less than 1% could be detected easily if present. Tests made by Ralph Stair, of the National Bureau of Standards, indicate that the glass bulb on the Eppley pyrheliometer has a constant transmission with respect to wave length for most of the solar radiation spectrum between 0.3μ and 4.2μ. Five of the instruments were tested by U. S. Weather Bureau, two by Bureau of Standards (1946). *Subject Headings:* **1. Eppley pyrheliometer 2. Calibration of instruments 3. Instrument comparisons 4. Airplane observations. I. Stair, Ralph II. U. S. National Bureau of Standards.**—*M.R.*

3.5–57 551.508.21:551.521.32:551.578.46

U. S. Corps of Engineers and U. S. Weather Bureau, **Penetration of solar radiation into the snowpack.** *U. S. Corps of Engineers and U. S. Weather Bureau Cooperative Snow Investigations, Technical Report* No. 8, *Interim Report* No. 1, March 1948. 12 p. **DWB**—Detailed description given of a very sensitive pyrheliometer, devised by the author, for measurement of solar radiation penetration into snowpack and used at Central Sierra Snow Laboratory at 6900 ft March 1947. It was found that the depth to which radiation was transmitted increased directly with increase of snow density. Absorption coefficients were obtained for snow between 26 and 40% density. Presence of ice and slush in the snow surface resulted in

decreased albedo and increased amount of radiation absorbed. There was, however, a 50% reduction in amount of radiation transmitted through the ice and slush layers to lower layers in the snow. *Subject Headings:* **1. Pyrheliometers 2. Radiation penetration of snowpack. I. Central Sierra Snow Laboratory.**—*A.M.P.*

3.5–58 551.508.23

Parsons, Frederick J., **The registration of bright sunshine.** *Weather*, 7(2):62–63, Feb. **1952. DWB**—Need for an instrument to record sunshine in both energy and actinic units instead of merely hours. *Subject Heading:* **1. Sunshine recorders.**—*C.E.P.B.*

3.5–59 551.508.26

Denton, Robert L., **A thermocouple voltage amplifier for temperature recording.** *American Meteorological Society, Bulletin*, 32(6):214–216, June **1951.** 3 figs., 4 refs., 3 equations. **MH-BH**—A description of the phototube feed-back amplifier used with an Esterline-Angus 0–1 ma. recorder with mechanical clock work drive is presented. An elemental circuit diagram showing the distribution of the voltages and a schematic diagram of the produced circuit are given. This device can be used with a milliameter to measure more accurately the low voltages found in thermocouple temperature measurements. The advantages of this amplifier are listed. *Subject Heading:* **1. Thermocouples.**—*I.L.D.*

3.5–60 551.508.26

Person, H., **Zur Temperaturvermessung.** [Temperature measurement.] *Baden, Landeswetterdienst, Jahresbericht mit Abhandlungen*, **1949.** p. 82–83. 3 figs. **DWB**—Describes a modification of the electrical measurement of temperature by means of a contact thermometer so as to eliminate difficulties of calibration and expensiveness of construction. The author proposes a mercury thermometer with a fused-in lead contact as a condenser in an oscillation circuit. Its construction is illustrated by means of a diagram and its use in radiosondes is described. *Subject Heading:* **1. Thermometers.**—*I.L.D.*

3.5–61 551.508.26

Zakrent, Stefan, **Termometry: ciśnieniowy i oporowy.** [Pressure and resistance thermometers.] *Gazeta Obserwatora PIHM*, Warsaw, 4(3):11–14, March **1951.** 5 figs., table, 4 equations. **DLC**—Contains a description of structure and principles of operation of different kinds of (mercury) pressure and resistance thermometers. A table showing the heat resistance of certain pure metals and alloys is added. *Subject Heading:* **1. Thermometers.**—*A.M.P.*

3.5–62 551.508.43:551.501.42

Klestova, M. M., **Pogreshnosti popravok aneroidov, primeniaemykh na seti meteorologicheskikh stantsiĭ.** [Errors in corrections to aneroid barometers used at meteorological stations.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):27–36, **1951.** 7 tables. **DLC**—The author discusses the errors in the temperature, scale and general corrections that are made for the old model aneroid barometers which had an external spring and the newer models lacking a spring. Tables of each type of correction with standard errors are given. *Subject Headings:* **1. Aneroid barometers 2. Instrumental errors.**—*I.L.D.*

3.5–63 551.508.49:551.541

Bernasconi, Carlo and Bossolasco, Mario, **Le barovariographe comme appareil de sondage aérologique.** [The barovariograph as a device for aerological soundings.] *Geofisica Pura e Applicata*, 20:197–202, July/Dec. **1951.** 2 figs., 5 refs., 5 equations. In French; English, German and Italian summaries p. 197. **MH-BH**—The theory of the barovariograph or microbarograph is outlined for the case of the closed and open valve, respectively. The use of such instruments by Japanese for studying propagation of atmospheric waves, and suggestions for use in aerological studies such as of föhn waves, gravity waves of other types and rapid atmospheric oscillations, frontal passages, thunderstorm phenomena, blocking action, etc. are discussed. *Subject Headings:* **1. Microbarographs 2. Atmospheric oscillations.**—*M.R.*

3.5–64 551.508.5

Sanford, Edward R., **A wind tunnel investigation of the limitations of thermistor anemometry.** *Journal of Meteorology*, 8(3):182–190, June **1951.** 13 figs., 7 tables, 5 refs. **DWB**—In this study of the operating characteristics and suitability of the thermistor as an anemometer the following items are considered: the functional relationship between the power dissipated in the thermistor and the wind velocity and this relationship upon changes in ambient temperature and in wind direction, the lag of the thermistor for changes in wind speed and extent to which undesired responses of the thermistor can be eliminated. The wind tunnel and the procedure and equipment are described. It is concluded that the constant resistance mode of operation is most suitable for using the thermistor as a good anemometer. *Subject Headings:* **1. Wind instruments 2. Wind tunnel experiments.**—*I.L.D.*

3.5–65 551.508.54

Iwase, I., **Starting torque measurement of Robinson's cup anemometer.** *Journal of Meteorological Research*, Tokyo, 3(7):247–248, May **1951.** 3 figs., table. In Japanese, English summary p. (17). **DWB**—The starting torques of anemometers having cups similar to the Robinson type were measured and a linear relation was found to hold between the starting torque and the weight of cups with the wind pressure upon them. *Subject Headings:* **1. Anemometers 2. Robinson's anemometer.**—*From author's abstract.*

3.5–66 551.508.53/4:551.51:551.556.4

Mazzarella, Daniel A., **An all-weather, remote-recording bivane.** *U. S. Atomic Energy Commission, AECU-1243*, Aug. 8, **1951.** 29 p. 11 figs., table, 15 refs. Also in: *American Meteorological Society, Bulletin*, 33(2):000–000, Feb. **1952. DWB**—Designed by author and P. H. Lowry at Brookhaven, N. Y., for recording long period gusts and their effect on diffusion or dispersion of stack effluents. The instrument was intended for use on the higher levels of the 420 ft tower to record eddies of a period of about 5 minutes (which bring smoke to the ground). Construction, wind tunnel tests, field tests (since Jan. 1950) and comparisons during more than a year of operation are described. Corrosion was almost eliminated but rain, snow, ice and high winds such as occurred during the Nov. 27, 1950 storm interrupted continuous records or made them inaccurate. *Subject Headings:* **1. Wind recorders 2. Turbulence measurement 3. Diffusion of gases 4. Stack effluents. I. Brookhaven National Laboratories, N. Y. II. Lowry, P. H.**—*M.R.*

3.5–67 551.508.53/4:621.315

Zilitinkevich, S. I., **Novye sistema i pribory dlia distantsionnykh izmerenii elektricheskikh i neelektricheskikh velichin.** [New method and devices for distant measurements of electrical or non-electrical quantities.] Leningrad, Lenizdat., **1946.** 79 p. 35 figs., 8 tables, 47 equations. **DLC**—In the first part, the author discusses a special kind of periodic electrical current and describes four anemometers, constructed with utilization of condensers, and a universal measurement apparatus for remote measurements all designed by the author and based on the properties of this periodic current. The second section presents a theoretical discussion of a detector-measurement device with resolving power. *Subject Headings:* **1. Recording anemometers 2. Distant recording equipment.**—*C.K.*

3.5–68 551.508.71

Bellaire, F. R. and Anderson, L. J., **Thermocouple psychrometer for field measurements.** *American Meteorological Society, Bulletin*, 32(6):217–220, June **1951.** 5 figs., table, 2 refs. **MH-BH**—A thermocouple psychrometer, consisting of a dry and a wet thermocouple unit and using natural ventilation, is described and photographs of the apparatus are presented. Protection against radiation is provided by a tetraskelion shield. In winds <1 m.p.h. its accuracy is within $\pm 0.1°C$. In winds >1 m.p.h. its accuracy diminishes because of accumulation of moist air inside the chamber. *Subject Heading:* **1. Psychrometers.**—*I.L.D.*

3.5–69 551.508.71

Gaken, G. L., **Ob izmenchivosti popravok gigrometrov.** [The variability of corrections for hygrometers.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):93–

396, 1951. 3 figs., table, 5 refs. **DLC**—An analysis of the behavior of hygrometers at low temperatures shows that the corrections of hygrometers vary slightly when humidity is low but vary considerably when the humidity changes suddenly. The variations of the hygrometer corrections for each month were studied by calculating the mean difference between psychrometer and hygrometer readings. Procedures for improving the accuracy of corrections are presented. *Subject Headings:* **1. Hygrometers 2. Humidity measurement 3. Instrumental errors 4. Instrument comparisons.**—*I.L.D.*

3.5–70 551.508.71

Kameneva, A. I., **O tochnosti poverki volosnykh gigrometrov.** [On the accuracy of the calibration of hair hygrometers.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):49–65, **1951.** 3 figs., 9 tables, 5 refs., equation. **DLC**—An experimental procedure for analyzing the errors of calibration of hair hygrometers is described. The author discusses the nature of the errors arising in the determination of corrections for hygrometers, errors arising in corrections when the humidity either rises or falls, errors in the determination of the sensibility of hygrometers, especially during a high atmospheric humidity, and errors arising in calibration at relative humidities below 20%. *Subject Headings:* **1. Hair hygrometers 2. Calibration of instruments 3. Instrumental errors.**—*I.L.D.*

3.5–71 551.508.71

Kameneva, A. I., **Pogreshnosti poverki aspiratsionnykh psikhrometrov.** [Errors in the calibration of aspiration psychrometers.] *Leningrad, Glavaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):37–48, **1951.** 10 tables, 5 refs.; 4 equations. **DLC**—The author obtained experimentally a quantitative estimate of errors affecting the precision and correctness of the calibration of large size psychrometers. He discusses the determination of the rate of aspiration and the errors inherent in this procedure, experimental data on the errors of calibration due to micronozzle and micromanometer, errors in determining the time of a single rotation of the drum and a comparison of the methods used in the U.S.S.R. for determining rate of aspiration. *Subject Headings:* **1. Aspiration psychrometers 2. Instrumental errors 3. Calibration of instruments.**—*I.L.D.*

3.5–72 551.508.822

Grossi, M. and Mancianti, M., **Nuovo tipo di radiosonda per il rilieve del gradiente atmosferico di temperatura, umidità e pressione.** [New type of radiosonde for the recording of the atmospheric gradient of temperature, humidity and pressure.] *L'Aerotecnica*, Rome, 33(3):132–137, June 15, **1950.** diagrs. In Italian, English summary p. 156. **DLC**—Various systems used in construction of radiosondes of three main types are described. The new type is, in general, similar to that used by the Swiss and French, but contains no mechanical parts except the aneroid barometer. Signals of acoustic frequency are controlled by a pressure element which varies the capacity and the temperature varies the resistance of the circuit. The timing of the commutation varies with a resistance which is sensible to relative humidity. The theory, specifications for the various elements, wiring circuits for transmitter and recorder and examples of records are presented. It has been tested in the Laboratory of Radiotechnology of the Naval Academy at Livorno, Italy. *Subject Headings:* **1. Radiosondes 2. Radiosonde recorders.**—*M.R.*

3.5–73 551.508.822:551.578

Suryanarayana, D. and Kachare, N. R., **A note on the behaviour of radiosonde balloons during rain.** *Indian Journal of Meteorology and Geophysics*, 2(4):306–308, Oct. **1951.** 2 figs. **MH-BH**—Oscillations of radiosonde balloons between two definite levels are attributed to the accumulation of snow or frozen water at the level of 0°C or a few degrees below it. *Subject Headings:* **1. Radiosondes 2. Freezing water effects.**—*A.A.*

3.5–74 551.508.96:551.594.51

*Vegard, L. and Kvifte, G., **An auroral spectrogram and the results derived from it.** *Geofysiske Publikasjoner*, Oslo, 18(3), **1951.** 23 p. 11 figs., 2 tables, 14 refs., 4 equations.

MH-BH —The spectrogram was photographed by a new instrument and 310 new lines were found. Auroral lines from 8858 to 3114 Å are given. The results are compared with previous measurements. The ionospheric temperature, determined by means of the N_2^+ Band 3914, was −54.1°C. *Subject Headings:* **1. Auroral spectra 2. Temperature of the ionosphere 3. Auroral instruments.**—*A.A.*

SYNOPTIC ANALYSIS AND FORECASTING

(*See also items:* 3.5–7, 3.5–36, 3.5–137, 3.5–149, 3.5–152, 3.5–194)

3.5–75 551.509

Bregman, G. R., **Ob effektivnosti prognoza.** [Effectiveness of forecasts.] *Meteorologiia i Gidrologiia*, No. 8:3–16, Aug. 1948. 2 figs., 12 equations. **DLC**—The author states that the planned economy of the Soviet Union has placed new requirements on the weather forecast service. Besides preventing undesirable effects of certain meteorological and hydrological phenomena, forecasts must contribute to the optimum utilization of natural conditions. The evaluation of the methods and results of the forecasts must be changed accordingly. Besides certain mean degrees of accuracy, the requirements for the forecasts are reliability in space, i.e., in relation to regional or local physical and geographical conditions, and in time, i.e., in relation to various climatic cycles and seasons for long range forecasts and to sudden change in processes and phenomena for short range forecasts. Moreover, a new criterion for satisfactory forecasts is introduced—effectiveness, which is evaluated according to its advantage for a specific economic activity. The effectiveness of forecasts has to be expressed in money value. The author presents an analysis of effectiveness of forecasts depending on one of three kinds: forecasts contributing to future planning and to achievement of current economic tasks, forecasts contributing only to current activity and forecasts containing warning of dangerous phenomena. For each, specific formulas are worked out. *Subject Headings:* **1. Weather forecasting 2. Industrial meteorology 3. Forecast accuracy.**—*C.K.*

3.5–76 551.509:551.501.45

Lingelbach, E. and Hinkelmann, K., **Wettervorhersage mit Rechenmaschinen?** [Weather forecasting with calculating machines?] *Umschau*, Frankfurt a.M., 51(16):481–483, Aug. 1951. 2 figs., 2 refs. **DLC**—Obtaining continuous data on synoptic elements from all parts of the atmosphere and formulating the correlation of weather elements in terms of mathematical functions are indicated as major problems in automatically computing weather forecasts. Mathematical requirements for meteorological forecasting computers are established and declared to be within actual technical feasibility, although their realization is still prevented by a few obstacles. *Subject Headings:* **1. Weather forecasting 2. Computing machines 3. Observational data 4. Mathematical techniques.**—*G.T.*

3.5–77 551.509

McComber, Camilla, **Weather 1212; scientific forecasting, climatic statistics save American business millions.** *Federal Science Progress*, Washington, D. C., 1(1):20–23, Feb. 1947. **DWB**—The importance of telephone weather recordings giving short notice and extended forecasts for such enterprises as construction, handling certain types of merchandise, various industries, agriculture, recreation, navigation, aviation, etc. is described in a popular article pointing out the accomplishments of the Weather Bureau in this field. The photographs and notes, following the article, illustrate various activities dependent on weather. *Subject Headings:* **1. Telephone weather forecasts 2. Industrial climatology.**—*G.T.*

3.5–78 551.509.31:551.515.8(26)

Baynton, H. W., **Notes on frontal analysis over the North Atlantic.** *Canada, Meteorological Division, Cir-*1958; *Local Forecast Study* No. 8, June 1, 1951. 5 p. ref. **DWB**—Some characteristics of warm and cold air masses and indications of frontal passages as revealed by the 3-hourly reports of the stationary ocean weather ships are described, accounting for temperature, pressure, wind shift, dew point, visibility, cloudiness and precipitation. *Subject Headings:* **1. Weather forecasting 2. Fronts 3. Weatherships 4. North Atlantic.**—*G.T.*

3.5–79 551.509.31:551.515.4

Simila, Arthuri. **En ny synoptisk-aerologiska metod att förutsäga åska.** [A new synoptic-aerologic method for forecasting thunderstorms.] *Sweden, Meteorologiska och Hydrologiska Institut, Meddelanden, Ser. B, No. 8, 1950.* 15 p. charts, graphs, refs. DWB—Since instability in the free atmosphere determines the extent to which convective clouds can grow vertically and give rise to thunderstorms and since it changes slowly within an air mass it is possible to determine and map the area of stability and instability. The use of the slope method for determining the temperature gradient within a cloud, the derivation of equations for calculating instability and probability of thunderstorms and the Rossi formula for determining relative humidity within an air layer are described. Application of these formulas for mapping thunderstorm probability over western Europe is shown in a series of maps. *Author Abstract.*
1. Thunderstorm forecasting 2. Synoptic forecasting 3. Rossi formula 4. Western Europe.—*I.L.D.*

3.5–80 551.509.32:551.515.1(41)

Watts, Ian E. M., **Forecasting New Zealand weather.** In: Garner, E. [ed.] **New Zealand weather and climate.** Christchurch, New Zealand, Whitcombe and Tombs, 1950. p. 36–44. photos, charts, diagrs.) Reprint from: *New Zealand Geographer*, v. 2, 119–138, Oct. 1945. DLC—The effect of local topography on the general circulation, cyclones, anticyclones, winds and weather is vividly illustrated by novel relief charts and simple synoptic or air flow diagrams, as well as described in text. Special treatment is given to northwesterlies, southerlies, cold fronts, frontal deformation, wave depressions, westerly wave series, etc. These types are not treated schematically or idealistically but on the basis of actual occurrences (sometimes in combinations of two or more). Lack of reporting stations over vast seas in all directions is chief drawback to accurate forecasting in this area. *Author Headings.*
1. Synoptic forecasting 2. New Zealand.—*M.R.*

3.5–81 551.509.34:551.577.34

Krishna Rao, D. and Menon, P. A., **Utility of precipitation index for local forecasting at Bombay during the monsoon months.** *Indian Journal of Meteorology and Geophysics*, 2 (4), Oct. 1951. table, 2 refs. MH-BH—Examination of the precipitation index calculated by SCHELL's method as a guide to local forecasting at Bombay. In cases where the index is greater than seven, precipitation occurred on all occasions. In other parts of India the critical value was found to range from three to eight. No significant relationship between the intensity of the precipitation and the magnitude of the precipitation index has otherwise been found. *Author Headings.*
1. Rainfall index 2. Local forecasting 3. Monsoons 4. Bombay, India.—*A.K.*

3.5–82 551.509.39:551.579.4

Kamantsev, B. P., **Ispol'zovanie gidrologicheskogo podobiia rechnykh basseinov dlia prognozov pavodkov.** [Use of hydrological similarity of river basins for flood forecasting.] *Meteorologiia i Gidrologiia*, No. 5:37–42, Nov. 1950. 6 figs, 5 refs., summaries. DLC—The author stresses the decisive role of the development and position of grass in controlling snow melt and rainfall, and of the effective rainfall in determining the occurrence of floods and the similarity of river basins. A theoretical analysis of the conditions of similarity of river basins is presented. *Author Headings.*
1. Flood forecasting 2. Hydrography 3. River basins.—*I.L.D.*

3.5–83 551.509.30:551.579

Popov, E. G., **O raschete poverkhnostnogo zaderzhaniia vody v rechnykh basseinakh dlia tselei prognoza stoka.** [On the calculation of surface water retention in river basins for runoff forecasting.] *Meteorologiia i Gidrologiia*, No. 1:52–60, Sept. 1950. 5 figs, 17 formulas. DLC—Description of a method of calculation. The first stage is the computing of the integral curve of rainfall, after that the curve of water retention capacity is obtained. The verification of the method was made for Vishera River near Mirakovo and showed good results. *Author Headings.*
1. Runoff forecasting 2. Surface water retention 3. River basins.—*I.L.D.*

3.5–84 551.509.5:37

Bergeron, Tor, **Ways of improving the weather service.** *Weather*, 7(2):48–49, Feb. 1952. fig. **DWB**—Suggests fewer but more efficient reporting stations, training forecasters in actual *weather*, and studies of detailed weather in different air mass types and winds. *Subject Headings:* **1. Weather forecasting 2. Training in meteorology.**—*C.E.P.B.*

3.5–85 551.509.5

†Gringorten, Irving I., **The verification and scoring of weather forecasts.** *American Statistical Association, Journal*, 46(255):279–296, Sept. 1951. 10 tables, 18 refs., 24 equations. **DWB**—The author attempts to show that the rating of forecasts for utility must be kept distinct from rating for skill. In the former case, the rating should be in terms of operational requirements or value of the forecast; in the latter case, the rating should be on the basis of the "forecaster's ability to analyze and classify the antecedent weather so that, within one class, the probability of a subsequent event is increased above or decreased below the relative frequency of that event in all weather situations." Theory is developed in detail and examples given for flying weather classification forecasts at Randolph Field, Texas or frequency of weather classes at Mitchel Field, N. Y. *Subject Headings:* **1. Forecast verification 2. Forecasting skill.**—*M.R.*

3.5–86 551.509.51:551.509.25(7)

Massachusetts Institute of Technology, **Experimental study of visual grading of prognostic pressure maps.** Contract W-28-099-ac-398, Report No. 11, Nov. 1, 1950. 12+23 p. tables, append. **DWB**—In order to avoid the unsatisfactory results obtained by verifying "objectively" prognostic charts by systems of parameters and correlation of these parameters (orthogonal polynominals), a method of visual evaluation by 5 experiments in which 4 meteorologists rated a series of charts was listed statistically. Analogs were first selected on the basis of fronts alone, but the appearance of the entire North American chart was used in grading. Stricter criteria for picking analogs did not improve the agreement between the 4 graders, so improvement in grading methods was attempted by specifying features to be graded, and last by dividing the continent into 4 quadrants and grading each separately, then averaging grades. This gave better agreement than other procedures. *Subject Headings:* **1. Prognostic charts 2. Forecast verification 3. Analog selection I. Wadsworth, G. P. II. Contract W-29-099-ac-398.**—*M.R.*

3.5–87 551.509.54:551.547

Murray, R., **Rain and snow in relation to the 1000–700-mb. and 1000–500-mb. thicknesses and the freezing level.** *Meteorological Magazine*, London, 81(955):5–8, Jan. 1952. 5 tables. **DWB**—To aid in forecasting type of precipitation, frequencies of rain, sleet [British] and snow are presented for various thicknesses and for freezing levels and surface temperatures at 7 British stations. Critical values: 1000–700 mb, 9120 ft; 1000–500 mb, 17,140 ft; freezing level, 1000 ft; surface temperature, 34°F. Hail is also considered. *Subject Heading:* **1. Precipitation forecasting.**—*C.E.P.B.*

3.5–88 551.509.54 551.509.53(792)

Williams, Philip, Jr., **The use of confidence factors in forecasting.** *American Meteorological Society, Bulletin*, 32(8):279–281, Oct. 1951. 4 tables, 6 refs. **MH-BH**—Brief report on precipitation forecasts by the U. S. Weather Bureau at Salt Lake City, in which the estimated probability of occurrence was indicated by the number 6, 8 or 10 (out of 10). Results obtained are shown in tables and claimed to suggest practicability of the method. The same principle is applied to forecasts of maximum or minimum temperature. *Subject Headings:* **1. Forecast probabilities 2. Forecast verification 3. Salt Lake City, Utah.**—*G.T.*

3.5–89 551.509.58

Nikiforov, P. P., **Nekotorye itogi obsluzhivania narodnogo khoziaĭstva otdelom morskikh prognozov Tsentral'nogo instituta prognozov za poslednie gody.** [Some conclusions on the

service rendered by the Department of Marine Forecasting of the Central Institute of Forecasts to national economy during recent years.] *Meteorologiia i Gidrologiia*, No. 1:65–69, Sept. 1950. **DLC**—Review of forecasting service for the fishing industry of Sakhalin in 1949–1950 and of Caspian oil fields in 1950. The ice conditions of the Caspian sea during winter 1949–1950 required a special organization of the forecast service because the ice was very thick and covered a wide area of the sea. *Subject Headings:* **1. Marine forecasting services 2. Ice forecasting 3. Fishing 4. Sakhalin Island, U.S.S.R. 5. Caspian Sea, U.S.S.R.**—*N.T.Z.*

3.5–90 551.509.58:636

Porfir'ev, I. F., Stepanov, V. A. and Fedoseev, A. P., **Opyt gidro-meteorologicheskogo obsluzhivaniia pastbishchnogo zhivotnovodstva v Kazakhstane.** [Investigation by the hydrometeorological service on animal husbandry in Kazakhstan.] *Meteorologiia i Gidrologiia*, No. 2:34–38, Oct. 1950. **DLC**—Glazed frost, snow storms, severe frosts, gales, hot spells and hail cause great damage to the cattle-raising industry. A large number of cattle in Kazakhstan perished during the last 100 years from these causes. A special system of weather warning was arranged in Kazakhstan by the Hydrometeorological Service during 1949–1950. Numerous references in local newspapers show the good results of this first experiment. *Subject Headings:* **1. Agro-meteorological forecasting 2. Animal husbandry 3. Kazakhstan, U.S.S.R.**—*N.T.Z.*

3.5–91 551.509.6:623.45:551.465

Holzman, B. G., **Meteorological aspects of the atomic "Base Surge."** *American Meteorological Society, Bulletin*, 32(7):251–258, Sept. 1951. 8 figs. **MH-BH**—The effects of the underwater detonation of an atomic bomb at Bikini are described and the "base surge" wave (which resembles the outflow of cold air from an intense summer thunderstorm) beautifully illustrated by several photographs taken from different viewpoints and at different stages. In addition to the "cold front" effects, the cloud formations, precipitation and other condensation processes are revealed with remarkable vividness in this series of pictures. *Subject Headings:* **1. Bikini atom bomb tests 2. Base surge 3. Cloud formations 4. Bikini, Marshall Islands.**—*M.R.*

3.5–92 551.509.6(04)

Namias, Jerome, **No, the weather is not changing.** *New York Times Magazine*, Oct. 21, 1951. p. 23. 2 tables. **DLC**—A popular article in which the author refutes the talk of "back porch specialists" about "weather getting out of hand." As far as "normal" weather is just the average weather over a long period of time, deviations from this "normal" which, as the author proves, are constantly observed in one or another part of the country, are completely in line with the normal course of weather. The author denies that specific human activities, such as commercial rain making, have any actual influence on weather conditions. *Subject Headings:* **1. Weather 2. Popular meteorology.**—*C.K.*

3.5–93 551.509.62:551.524.4(94)

Frith, H. J., **Frost protection in orchards using air from the temperature inversion layer.** *Australian Journal of Agricultural Research*, 2(1):24–42, 1951. photos, diagrs., graphs, biblio. Abstracted from reprint. **DLC**—The efficiency of the new 21 ft low speed vertical axis wind machine, described in this report, depends on the magnitude of the surface temperature inversion, the type of orchard and other factors. Graphs show typical inversions and variations thereof, including effects of orchards themselves on character of inversion, when compared with soundings over open ground. Horizontal extent of warming due to action of fan in citrus and almond groves is shown. Effect of time, of alternate operation of fan, etc. analyzed. Tests were made at Griffith, N.S.W. *Subject Headings:* **1. Frost protection 2. Orchard heating 3. Temperature inversions 4. New South Wales, Australia. I. Australia. Commonwealth Scientific and Industrial Research Organization.**—*M.R.*

3.5–94 551.509.62:629.135.4

Small, Robert T., **Report on the use of a heliocopter for frost protection for oranges.** [n.d.] 5 p. graphs. Mimeographed. **DWB**—Report on experiments carried out by the

Fruit-Frost Service of the Weather Bureau at Mission Ranch, a 100-acre orange grove in the San Fernando Valley, California. The experiments were aimed at breaking down the temperature inversion by blowing air down to fruit level through helicopter flights. Results are said to prove usefulness of this method and its financial advantages over fuel heating methods. It is pointed out, however, that during "freeze" conditions, when there is very little night inversion, the use of a helicopter alone would be of no value. *Subject Headings:* **1. Frost protection 2. Helicopters 3. Fruit-Frost Service 4. San Fernando Valley, California. I. U. S. Weather Bureau.**—*G.T.*

CLOUD SEEDING AND ARTIFICIAL PRECIPITATION

(*See also item:* 3.5–232)

3.5–95 551.509.67

Best, A. C., **The artificial production of rain.** Great Britain, Meteorological Office, 1951. 4 p. Mimeographed.—Clear, nontechnical account of present position of seeding by dry ice or AgI. *Subject Headings:* **1. Cloud seeding 2. Artificial precipitation.**—*C.E.P.B.*

3.5–96 551.509.67 551.574.1

Braham, R. R., Reynolds, S. E., and Harrell, J. H., Jr., **Possibilities for cloud seeding as determined by a study of cloud height versus precipitation.** *Journal of Meteorology*, 8(6):416–418, Dec. 1951. fig., 2 tables, 4 refs. **MH-BH**—In New Mexico, with cloud-top temperature above −12°C no radar echoes were found, from −12 to −24°C only one-fifth of the clouds gave echoes. Below −24°C presence of CuNb increased frequency of echoes. Seeding from ground by AgI had no effect. For summer seeding to be effective, cloud must extend from below 14,000 ft to at least 22,000 ft. *Subject Headings:* **1. Artificial precipitation 2. Cloud physics 3. Cloud seeding 4. Cloud height.**—*C.E.P.B.*

3.5–97 551.509.67

Davies, D. A., **Artificial stimulation of rain at Kongwa.** *Nature*, London, 167(4250):614–615, April 14, 1951. **DLC**—Describes two methods used in East Africa to produce particles of AgI—by burning charcoal impregnated with acetone solution of AgI and by exploding small charges of impregnated gunpowder. The charges are carried by hydrogen balloons into suitable clouds and released at freezing level by time fuses. *Subject Headings:* **1. Artificial precipitation 2. Silver iodide 3. Gunpowder charges 4. East Africa.**—*C.E.P.B.*

3.5–98 551.509.67:551.578.46(788)

Krick, Irving P. (*Pasadena, California*), **Snow pack increase in the Colorado Rockies by artificial nucleation.** *Western Snow Conference, Proceedings*, 19th Annual Meeting, April 1951. p. 108–110. table. **DWB**—An attempt to increase snow pack was begun in November 1950 in the upper Arkansas River Basin, and in other watersheds of Colorado from Jan. through April 1951. Silver iodide was used in all experiments. Success of method used evaluated by showing ratio of precipitation to water content of snow pack at Aspen, Colorado, for 1940–1950 and for Feb. 1, Mar. 1, and April 1, 1951 showing record (or almost record) conditions for 1951. *Subject Headings:* **1. Artificial snow pack 2. Cloud seeding 3. Silver iodide 4. Colorado.**—*M.R.*

3.5–99 551.509.67

Roulleau, J., **La pluie artificielle.** [Artificial rain.] *La Météorologie*, 4th Ser., No. 9:57–65, Jan.–March 1948. **DWB**—A historical summary of various theories of rain formation concludes that except in tropics the only efficient cause is the coexistence of liquid and solid particles in an ascending turbulent current of air. Methods of providing nuclei of condensation of ice (solid CO_2, AgI) are discussed and experiments in France mentioned. Only 1–2 mm rain per km cloud thickness results unless cloud is nearly ready to produce natural precipitation, but disastrous hail may be changed to beneficial rain. *Subject Heading:* **1. Artificial precipitation.**—*C.E.P.B.*

3.5–100 551.509.67(54)

Roy, A. K., **Rain-making and its possibilities in India.** *Indian Journal of Meteorology and Geophysics*, 2(4):241–249, Oct. 1951. 2 figs., 6 refs. **MH-BH**—A nontechnical account of the present position of rain making. Discussion of physical conditions for rain making in India, where clouds are rarely suitable for seeding. Therefore, from the practical point of view, the scope of rain making in India seems to be strictly limited. Includes explanations for rainless areas in India during a rainstorm. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. India.**—*A.A.*

3.5–101 551.509.67

Schaefer, Vincent J., **Induced precipitation and experimental meteorology.** *New York Academy of Sciences, Transactions, 2nd Ser.*, 12(8):260–264, June 1950. 12 refs. **DLC**—The physical properties of the atmosphere important in the formation of artificial rain, namely: supercooled clouds, ice nuclei and synoptic conditions are discussed. *Subject Headings:* **1. Artificial precipitation 2. Supercooled clouds 3. Ice crystals.**

3.5–102 551.509.67:551.521.1:551.574.1

Sunlight spoils particles. *Science News Letter*, 59(22):341, June 2, 1951. **DWB**—A brief report on the findings of EDWARD C. Y. INN that sunlight changes the shape of AgI crystals so that they lose their ice forming capacity. *Subject Headings:* **1. Silver iodide 2. Ice crystal formation 3. Radiation effects.**—*I.L.D.*

3.5–103 551.509.67

U. S. Congress. Senate. Committee on Interior and Insular Affairs, **Weather control and augmented potable water supply. Joint hearings before Subcommittee of the Committees . . . 82nd Congress, first session on S.5 . . . S.222 and S.798.** Washington, D. C., Govt. Print., **1951.** 353 p. figs., maps, charts, refs. **DLC**—A voluminous compilation of prepared statements, impromptu testimony and discussions of the scientific, commercial and legal aspects of rain making by CO_2 or AgI seeding of clouds and of other methods of increasing water supply, presented as transactions of the hearings which took place between March 14–19 and April 5, 1951 in Washington. Among those who testified at some length were W. F. MCDONALD of the U. S. Weather Bureau, PROF. HOUGHTON and NEUBERGER, WALLACE HOWELL, IRVING KRICK, VINCENT SCHAEFER and BERNARD VONNEGUT. The purpose of the bill is to establish federal control over rain making activities. *Subject Headings:* **1. Weather control hearings 2. Artificial precipitation 3. Water supply 4. Congressional hearings. I. U. S. Congress. Senate. Committee on Interstate and Foreign Commerce II. U. S. Congress. Senate. Committee on Agriculture and Forestry III. Anderson, Clinton P.**—*M.R.*

3.5–104 551.509.67

U. S. to probe rainmaking. *Science News Letter*, 60(14):213, Oct. 6, 1951. **DWB**—The U. S. Weather Bureau is planning to conduct a survey on the effectiveness of cloud seeding in producing artificial precipitation over 17 western States; California already has appropriated money for a study of the effects of cloud seeding. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. U. S. Weather Bureau 4. Western United States.**—*I.L.D.*

3.5–105 551.509.67

Vonnegut, Bernard (*General Electric Company*), **Cloud seeding.** *Scientific American*, 186(1):17–22, Jan. 1952. 6 figs. **DLC, DWB**—The author sums up the theory and problems of cloud and precipitation formation and cloud seeding and gives a survey of the history and results of Project Cirrus. A cloud chamber photograph, two excellent cloud photographs taken after seeding, an electron microphotograph of particles in silver iodide smoke and a picture of airplane and equipment are presented and a study of ice crystal persistence due to dry ice and AgI represented in a graph. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. Project Cirrus.**—*G.T.*

3.5–106 551.509.67

Warren, Leslie A., **The practical aspects of cloud seeding as a means of causing or increasing precipitation.** *Rio Grande Water Forecast Committee, Proceedings*, Second Annual Meeting, April 13, 1951, Sept. 1951. p. 8–13. **DWB**—Beginning with a statement of the official attitude of the Chief of the U. S. Weather Bureau in regard to the present status of rain making experiments by cloud seeding, the author goes on to quote several current opinions by research workers on both sides of the controversy including statements by HENRY G. HOUGHTON, WILLIAM LEWIS and VINCENT SCHAEFER. Exaggerated claims of success are discounted and the belief expressed that the possibilities will be known only after years of controlled tests in the field. *Subject Headings:* **1. Cloud seeding 2. Artificial precipitation 3. New Mexico. I. U. S. Weather Bureau.**—*M.R.*

3.5–107 551.509.67:551.577.11

Wexler, Harry, **Precipitation—natural and otherwise.** Washington, D. C., U. S. Weather Bureau, Sept. 20, 1951. 12 p. 2 figs. **DWB**—In this speech given before the American Society of Agricultural Engineers at Houston, Texas, WEXLER describes in a lucid manner the status of experiments on artificial rainfall production in the United States and the theoretical basis for such tentative conclusions as may now be made. The difficulty in drawing conclusions regarding the practical value of individual or serial attempts at rainfall stimulation stem from the extreme natural variability of rainfall in both time and space and the difficulty in predicting rainfall from a single storm. *Subject Headings:* **1. Artificial precipitation 2. Precipitation mechanism. I. U. S. Weather Bureau.**—*M.R.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

STRUCTURE OF THE ATMOSPHERE

(*See also item:* 3.5–66)

3.5–108 551.510:551.524

Kannuluik, W. G. and Carman, E. H., **The temperature dependence of the thermal conductivity of air.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 4(3):305–314, Sept. 1951. 2 figs., 7 tables, 15 refs., 5 equations. **MH-BH**—The thermal conductivity of air is determined in absolute measure between −183° and 218°C by the "thick-wire" variant of the "hot-wire" method. The apparatus consists of a platinum wire 11.6 cm long and 1.5 mm in diameter mounted in a 90% platinum, 10% iridium tube of 7 mm internal diameter. The temperature variation of the thermal conductivity of air can be represented with considerable accuracy by the quadratic formula: $k_t = 5.75 \times 10^{-5}(1 + 0.00317t - 0.0000021t^2)$. The present paper suggests a value for the thermal conductivity of air at 0°C from a consideration of the data which have been obtained by various hot-wire methods. *Subject Headings:* **1. Thermal conductivity of air 2. Air temperatures.**—*Author's abstract.*

3.5–109 551.510:523.2

†Landsberg, Helmut E., **Origin and physics of the atmosphere.** *New York Academy of Sciences, Transaction, 2nd Ser.*, 13(5):154–159, March 1951. 4 tables, 21 refs. **DWB** A concentrated treatment of many aspects of upper atmosphere research, beginning with several theories as to the origin of the earth's atmosphere; inferences as to its composition, based on spectroscopic determination of the composition of the atmospheres of Jupiter, Saturn, Neptune, Venus and Mars; temperatures of the planet Mars; new information on the composition of the earth's atmosphere from spectroscopic and rocket observations; physical structure of the atmosphere (exosphere, ionosphere, stratosphere and troposphere) and, finally, theories of the general circulation, based on Krakatoa eruption and ideas of FERREL, ROSSBY and PETTERSSEN. *Subject Headings:* **1. Origin of atmosphere 2. Atmospheric composition 3. Atmospheric structure 4. Planetary atmospheres.**—*M.R.*

3.5–110 551.510.3:523.5:778.3

Whipple, Fred L., **Densities in the upper atmosphere measured by photographic meteors.** *International Union of Geodesy and Geophysics, Association of Meteorology, Transactions, Oslo*

1948, Vol. 2, **1950.** p. 184. Mimeographed. **DWB**—Double station photography of meteors and measurement of meteoric velocity, deceleration, luminosity and height at altitudes from 46 to 93 km above sea level indicate seasonal variations in the density of the upper atmosphere. The seasonal effect was almost 0.5 in the logarithm of the atmospheric density at an average height of 78 km at latitude 42.5°N. The correlation of the residual with the normal mean ground temperature is 0.91, with actual mean ground temperature for the day 0.85 and with the solar insolation 0.66. *Subject Headings:* **1. Upper air density 2. Meteor trails 3. Meteor photography.**—*I.L.D.*

3.5–111 551.510.41:546.293:546.79

*Birch, Francis, **Recent work on the radioactivity of potassium and some related geophysical problems.** *Journal of Geophysical Research*, 56(1):107–126, March 1951. fig., 6 tables, numerous refs. **DWB**—A review of the work of the past 20 years on the decay constants of radioactive potassium, with respect to solving problems of the origin of the argon of the atmosphere, the contribution of potassium to the earth's heat and problems of geochronology. Decay constants for K^{40} by numerous authors (1930–1951) are tabulated for: (a) beta-emission, (b) energy of beta spectrum, (c) gamma-emission, (d) energy of gamma rays and (e) branching ratio for K-capture; also the energy production and half-life of potassium are tabulated according to various authorities (1926–1951). The half-life of K^{40} is fixed at 1.3×10^9 years and 12% of disintegration forms A^{40} and 88% Ca^{40}. Amount of A^{40} released to atmosphere is still uncertain. *Subject Headings:* **1. Radioactive potassium 2. Argon production 3. Atmospheric composition 4. Geochronology.**—*M.R.*

3.5–112 551.510.41:551.521.61:551.508.25

Goldberg, L., **Recent advances in infra-red solar spectroscopy.** *Physical Society of London, Reports on Progress in Physics*, 13:24–45, **1950.** graphs, diagr., biblio. **DWB**—An excellent presentation of the most up-to-date knowledge and data on the solar spectrum in the infrared. History of solar spectroscopy, a description of instruments used at McMath-Hulbert Observatory, an atlas of the infrared solar spectrum (.76μ–5.3μ), separate spectra due to various elements (laboratory compared with actual or those obtained from sunspot regions, photosphere, etc.). Telluric lines due to CO_2, N_2O, CH_4 and H_2O, and data on 13 bands of CO_2 are given in a table and many of the bands illustrated. Discovery of each band is reviewed. *Subject Headings:* **1. Solar spectra 2. Carbon dioxide absorption bands 3. Progress in physics 4. Infrared spectroscopy.**—*M.R.*

3.5–113 551.510.41:546.293

Poole, J. H. J. and Delaney, C. F. G., **Origin of atmospheric argon and the radioactive decay constants of potassium-40.** *Nature*, London, 167(4252):680–681, April 28, **1951.** table. **DWB**—Calculation of depth of surface layer which would be required to produce the argon in the atmosphere by decay of potassium-40 gave 70 km. Therefore, either argon was not derived from potassium-40 in the crust or it can escape from great depths, e.g., through volcanoes. *Subject Headings:* **1. Argon 2. Atmospheric composition.**—*C.E.P.B.*

3.5–114 551.510.41:551.464:620.19

Tikhonov, M. K., **Korroziia metallov v morskom vozdukhe.** [Corrosion of metals in sea air.] *Akademiia Nauk, SSSR, Morskoĭ Gidrofizicheskiĭ Institut, Trudy*, 1:75–82, **1948.** 6 figs., tables, 10 refs. **MH-BH**—Quantitative measurements of the intensity of corrosion of metals (iron and iron alloys) in sea air are described, tabulated and shown graphically and the effects shown in photographs. Methods of investigation are described in detail. Both mechanical and chemical (or electro-chemical) effects are considered, as well as area and shape of metal. An important study for meteorological instrumentation and installations at sea or at coastal stations. *Subject Headings:* **1. Corrosion 2. Sea air damage.**—*M.R.*

3.5–115 551.510.41:546.214

Wilson, W. S., **Surface ozone at College, Alaska.** *American Geophysical Union, Transactions*, 32(4):552–554, Aug. **1951.** 2 figs., 5 refs. **DWB**—Daily average values of the concentration of ozone in the atmosphere near the surface are determined by the oxidation by

ozone of iodine to iodide which in turn oxidizes sodium arsenite to sodium arsenate; a diagram of the absorption column is given. Measurements of ozone concentration obtained at College from Jan.–March 1950 indicate moderately large interdiurnal variations with the maxima considerably higher than the minima. The concentration of ozone increases with increasing altitude of the sun. The ozone values are much more irregular and averages much higher than those obtained at lower latitudes. *Subject Headings:* **1. Ozone 2. Ozone variations 3. College, Alaska.**—*I.L.D.*

3.5–116 551.510.42:63

Bleasdale, J. K. A., **Atmospheric pollution and plant growth.** *Nature*, London, 169(4296): 376–377, March 1, 1952. fig., 2 tables. **DWB**—Summary of laboratory and field experiments on growth of rye grass in and around Manchester in pure air and air contaminated by sulphur dioxide. *Subject Headings:* **1. Agriculture 2. Atmospheric pollution 3. Sulphur dioxide.**—*C.E.P.B.*

3.5–117 551.510.42:551.551

Eisenbud, Merril and Harris, W. B., **Meteorological technics in air pollution surveys.** *Archives of Industrial Hygiene and Occupational Medicine*, 3:90–97, Jan. **1951.** 4 figs., 2 tables, 3 refs., 5 equations. Abstracted from reprint. **DWB**—Theoretical studies on wind speed and turbulent diffusion, combined with actual tests made of concentration of gases at different distances downwind from a continuous point source or stack, have made it possible to determine dosages likely to occur under various weather conditions near sources of radioactive waste gases. SUTTON's equation is briefly explained and used to construct a nomogram for calculating concentrations up to 10 km from stacks 10, 25 and 50 m high, and tests conducted over a period of six days to see if the formula held good for two types of material (A and B) emitted from a stack. Agreement was found good for B but not for A. Other tests showed good agreement. *Subject Headings:* **1. Atmospheric pollution 2. Turbulent diffusion 3. Industrial hygiene.**—*M.R.*

3.5–118 551.510.42:551.591.3

Karpov, A. N., **Neobychnaia mgla nad Stalingradom.** [Unusual haze over Stalingrad.] *Priroda*, Moscow, 40 10 :52–53, Oct. **1951. DLC**—An opalescent darkening of the sky began on March 25 and the haze was strongest on March 27. The sky showed an unusual bright gray color at sunset; at night dust accumulated on the windward side of objects and its thickness was so great that it resembled hoar frost. The dust consisted of soil salts and clay particles. The visibility was reduced. Although air from the dry steppes of Kazakhstan had occupied the area from March 17 to March 28, the author believes that the characteristics of the dust indicated that the haze was not due to this air. *Subject Headings:* **1. Dust haze 2. Dust falls 3. Visibility 4. Stalingrad, U.S.S.R.**—*I.L.D.*

3.5–119 551.510.42:551.508.91:551.591

Magill, Paul L., **Techniques employed in the analysis of Los Angeles smog.** *National Air Pollution Symposium, Proceedings*, Nov. 10–11, **1949.** p. 61–68. 7 figs., 2 tables, 6 refs. **DWB**—Particulate matter was collected by the household-type Westinghouse Precipitron, the Sonkin impacter and a thermal precipitator; the concentration of particles in the atmosphere was measured by a specially designed dust camera. Diagrams of the apparatus are given. The author discusses the various substances producing poor visibility, a photographic method for measuring visibility and the atmospheric contaminants responsible for smog and eye irritation in the Los Angeles area. *Subject Headings:* **1. Atmospheric pollution 2. Smog 3. Air sampling and analysis 4. Visibility 5. Los Angeles, California.**—*I.L.D.*

3.5–120 551.510.42:551.575.5

Neuberger, Hans and Gutnick, M., **Experimental study of the effect of air pollution on the persistence of fog.** *National Air Pollution Symposium, Proceedings*, Nov. 10–11, **1949.** p. 90–96. 7 figs., 2 tables, 17 refs., 4 equations. **DWB**—A schematic diagram of the apparatus in which artificial fog is produced and the procedure for measuring transmitted light in the fog chamber as well as nuclei concentration are described. It is found that fog density

is not affected by variations in air pollution such as are usually found over continents, but duration increases with increasing air pollution. The relationship between fog duration and nuclei concentration and nuclei size is analyzed graphically and mathematically. *Subject Headings:* 1. Atmospheric pollution 2. Fog density 3. Fog duration.—*I.L.D.*

3.5–121 551.510.42 551.311.3:631.4

Obruchev, V.A., Rol' i znachenie pyli v prirode. [Role and significance of dust in nature.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr.*, No. 5:15–27, 1951. 13 refs. DLC—The author discusses the formation of dust as a result of drought, the phenomena of dust devils, dust clouds and dust storms with particular reference to Central Asia and European Russia; the geologic and climatic factors accounting for the origin of loess, the extent of loess formations in China and in other parts of the world (Europe, Russia, America (Argentina), etc.); and the physical properties of loess and its role in the human geography of China. *Subject Headings:* 1. Dust formation 2. Dust devils 3. Dust storms 4. Loess 5. China 6. Central Asia 7. U.S.S.R.—*I.L.D.*

3.5–122 551.510.42:551.575.1 551.508.91

Rubin, Sylvan, Liquid particles in atmospheric haze. *Journal of Atmospheric and Terrestrial Physics*, 2(2):130–140, 1952. 8 figs., 11 refs. DWB—Author describes a modified jet impactor and a potential electrostatic precipitator used to collect samples of smog at ground level at Los Angeles for microscopic study. Microphotographs shown and compared with gasoline exhaust and stack gas. Smog consists mainly of droplets with a variety of substances in solution, and is much less volatile than water droplets. Crystals are formed by evaporation. *Subject Headings:* 1. Atmospheric pollution 2. Smog 3. Los Angeles.—*C.E.P.B.*

3.5–123 551.510.5 (09)

Gerson, N. C., (*Air Force Cambridge Research Center*), Physics of the atmosphere. *Science*, 115(2980):3, Feb. 8, 1952. DWB—A highly concentrated summary of the history and present status of knowledge of the upper atmosphere, and the direct and indirect methods of determining its physical properties. Special emphasis is placed on knowledge gained or to be gained from auroral research. *Subject Headings:* 1. Upper atmosphere research 2. Auroral physics 3. History of meteorology.—*M.R.*

UPPER ATMOSPHERE—IONOSPHERE

(*See also items:* 3.5–284)

3.5–124 551.510.535 (0

Dieminger, W., Institut für Ionosphärenforschung in der Max-Planck-Gesellschaft, Lindau Harz. [Institute for ionosphere investigation in the Max-Planck Company.] *Naturwissenschaftliche Rundschau*, 4(5):210–218, May 1951. 4 figs. DLC—A description of the automatic apparatus for recording height of electron concentration, reflection of different frequencies, reception of short waves and horizontal magnetic field. Illustrates normal and abnormal records and briefly discusses results and their bearing on other systems. *Subject Headings:* 1. Ionospheric research. I. Max-Planck Gesellschaft. Institut für Ionosphärenforschung.—*C.E.P.B.*

3.5–125 551.510.535:523.74

Gallet, R. and Rower, Karl, Ionisation de la couche F2 et l'activité solaire sur l'ensemble du globe (tables numériques). [Ionization of the F2 layer and the solar activity over the entire globe (numerical tables).] *Annales de Géophysique*, 6(3):213–216, July–Sept. 1950. 2 tables. MH-BH—This is a supplement to an article which appeared in the April–June 1950 issue on p. 104. [*See item* No. 2.2–57 in Feb. 1951 *Meteorological Abstracts*.] *Subject Headings:* 1. Ionization 2. F2 layer 3. Solar activity.—*I.L.D.*

3.5–126 551.510.535:621.396.11

Mitra, A. P. (*Univ. of Calcutta*), The D-layer of the ionosphere. *Journal of Geophysical Research*, 56(3):373–402, Sept. 1951. 19 figs., 5 tables, 35 refs., 15 equations. MH-BH—

Normal (75–90 km) and sporadic (90 km in tropics) D layers are described on the basis of present knowledge and effects on long and short wave radio propagation and reflection discussed. Theories of origin include that of Mitra, Bhar and Ghosh (UV ionization of O_2), Jortner and Massey (photo-ionization of atomic sodium) and Nicolet (O_3, Na and NO ionization); theories of the D layer structure include models by Bremmer, Rydbeck, Booker, Ratcliffe, Stanley and Pfister which are used in calculations. In spite of widely differing theories of above workers, the temperature profile up to 100 km is fairly well-established and the composition of the atmosphere uniform, so a detailed picture of the ion or electron density distribution, its variation with time, place and height, and the variation of the effective height of reflection with solar zenith angle can be presented. The conclusions drawn from the elaborate statistical and graphical models presented here, are: 1) the electron distribution in no way follows the Chapman law since the electron distribution increases continuously with height up to the E layer, the ion distribution does show a similarity to the Chapman distribution; 2) the variation of reflecting height with zenith angle for long waves can be explained on the basis of ion formation distribution; 3) the theoretical reflection coefficient at low frequency ranges agree with experimental results, and 4) quantitative results based on observation confirm that the D region is produced by ionization of the O_2 at the first ionization potential. *Subject Headings:* 1. D layer 2. Ionospheric structure 3. Long wave radio propagation.—*M.R.*

3.5–127 551.510.535

Osborne, B. W., **Ionospheric behaviour in the F2 region at Singapore.** *Journal of Atmospheric and Terrestrial Physics*, 2(1):66–78, 1951. 8 figs., 11 refs. MH-BH—Describes measurements of critical frequency and virtual height Nov. 1948–Aug. 1950 in 1°19N, 103°49E. In daylight main types were: Nov.–Feb. thick F2 layer during 2 hours after dawn, becoming unstable or turbulent after 9 hr L.M.T.; June–Aug. stable thick layer in afternoon with low critical frequency; March–May and Sept.–Oct. single layer of higher critical frequency throughout day. Annual and diurnal variation of thick layer analyzed. After sunset at ground there was a rapid rise of minimum virtual height to a maximum at sunset at 390 km. Greatest scatter around 20 hr. The interpretation of the results is discussed. *Subject Headings:* 1. F layer 2. Singapore.—*C.E.P.B.*

3.5–128 551.510.535

Rawer, K., **Comparaison des résultats des mesures de l'absorption ionosphérique effectuées par deux stations européennes.** [Comparison of the results of measurements of ionospheric absorption made by two European stations.] *Journal of Atmospheric and Terrestrial Physics*, 2(1):38–50, 1951. 7 figs., 3 tables, 15 refs., equations. English summary p. 38. MH-BH—Difficulties of the method of impulses for measuring absorption in D layer are discussed and procedure at Freiburg set out. The seasonal variations at Slough (England) are compared with zenith angle of sun. Mean values have a high correlation with sunspot numbers. Daily observations at Slough and Freiburg have a small correlation (av. +0.4); smallness may be due partly to differences of procedure. Appendix describes a rapid method of correlation by counting signs of differences from median. *Subject Headings:* 1. Ionospheric research 2. D layer 3. Freiburg, Germany 4. Slough, England.—*C.E.P.B.*

3.5–129 551.510.535

Shinn, D. H. and Whale, H. A., **Group velocities and group heights from the magnetoionic theory.** *Journal of Atmospheric and Terrestrial Physics*, 2(1):85–105, 1952. 16 figs., 6 tables, 22 refs., 9 equations. DWB—Revised values of vertical component of group velocity of waves in the ionosphere are found for southeast England and are used to compare the apparent height of reflection of a parabolic layer in various magnetic latitudes. It is found that the standard method of estimating the thickness of an ionospheric layer gives results which are too high; inclusion of geomagnetic field gives better agreement with measurements. *Subject Headings:* 1. Ionosphere 2. England.—*C.E.P.B.*

3.5–130 551.510.535

Stenzel, Jerry, **On the definition of virtual height.** New York University, Mathematics Research Group, Contract AF-19(122)-43, Research Report No. EM-37, Feb. 1951. 43 p.

11 figs., 1 table, 27 refs., equations. **DWB**—The classical definition of virtual height is in terms of geometric optics. The wave theory definition is shown to have certain advantages and can be made to agree with the classical, but presents other difficulties. In the appendix, nomograms are given and theory presented for determining virtual height for various electron distributions. *Subject Headings:* **1. Ionospheric soundings 2. Virtual height. I. New York University. Mathematics Research Group II. Contract AF-19(122)-42.**—*M.R.*

3.5–131 551.510.535:550.385

Stranz, Dietrich, **Weitere Ergebnisse der Fade-out Statistik.** [Further results of fade-out statistics.] *Journal of Atmospheric and Terrestrial Physics*, 2(1):79–82, **1951.** 4 figs., 7 refs. English summary p. 79. **MH-BH**—As in earlier investigations, the smoothed mean magnetic character figures from 5 days before to 5 days after 35 sudden ionospheric disturbances showed a sudden drop at +3 days. Differences 1948–1949 due to approach of sunspot minimum. *Subject Headings:* **1. Ionospheric disturbances 2. Terrestrial magnetism.**—*C.E.P.B.*

3.5–132 551.510.535:621.396

Watts, J. M. and Brown, J. N., **Effects of ionosphere disturbances on low frequency propagation.** *Journal of Geophysical Research*, 56(3):403–408, Sept. **1951.** 8 figs., 3 refs. **MH-BH**—Observations made at the National Bureau of Standards from May–Nov. 1950, of vertical-incidence pulses from a vacuum-tube transmitter at frequencies of 50, 100 and 160 kc show a uniform virtual height of about 90 km. Fluctuations on disturbed days are shown in 7 figures, where records of the reflections from 1 to 3 layers between 60 and 320 km height are reproduced, as made on 35-mm film. The explanation of these variations, given for each case, shows that ionospheric storms have sudden and marked effects in nighttime reflection from the E layer. Daytime effects are more limited. Close correlation is shown between % disturbed operating time and normal magnetic K indices, (for Cheltenham) at night. *Subject Headings:* **1. Long wave reflection 2. Ionospheric disturbances 3. E layer. I. U. S. National Bureau of Standards.**—*M.R*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

(*See also items:* 3.5–2, 3.5–3, 3.5–5, 3.5–10, 3.5–12, 3.5–148, 3.5–149, 3.5–154, 3.5–162, 3.5–220)

3.5–133 551.511

Arakawa, H., **Bernoullian surfaces in meteorology.** *Papers in Meteorology and Geophysics*, Tokyo, 2(1):65–66, March **1951.** equations. **DWB**—It is shown that when a barotropic fluid has a steady frictionless motion, the sum of the kinetic energy per unit mass, the geopotential and the barotropic pressure function has no variation along stream lines nor along the total vortex lines. Hence, the sum is constant upon each of a family of the Bernoullian surfaces containing the stream lines and the absolute vortex lines through the common points. *Subject Headings:* **1. Bernoullian surfaces 2. Dynamics of the atmosphere.** *Author's abstract.*

3.5–134 551.511

Arakawa, H., (*Tokyo, Japan, Met. Inst.*), **Intrinsic equations of motion in dynamical meteorology.** *Geofisica Pura e Applicata*, 20:50–55, July–Dec. **1951.** 2 figs., 3 refs., 16 equations. **MH-BH**—Tangential and normal equations of horizontal motion along and normal to the characteristic lines (for example: stream lines, isobars, isotherms, etc.) are derived in general form. The latter section of this paper is devoted to applications to natural coordinates and the coordinates chosen to lie parallel and normal to the isobars. *Subject Headings:* **1. Equations of motion 2. Dynamic meteorology.**—*Author's abstract.*

3.5–135 551.511:551.524.7:551.557

Banerji, S. K., **Relationship between wind velocity and temperature of the free atmosphere.** *Indian Journal of Physics*, 21(2):50–56, April **1947.** 2 refs., 26 equations. Abstracted from reprint. **DLC**—Gives formulas for calculating the horizontal temperature gradient in the free air from pilot balloon observations. Sir Napier Shaw's formulas, which assume geostrophic motion, are usually inapplicable to tropics. The formulas can be used for determining

the structure of cyclones or anticyclones. *Subject Headings:* **1. Dynamics of the atmosphere 2. Temperature gradient 3. Upper air winds.**—*C.E.P.B.*

3.5–136 551.511:551.515.8

Berggren, Roy K., Bolin, B. and Rossby, Carl-Gustav, **On the mechanism of changes in the upper flow pattern.** *International Union of Geodesy and Geophysics, Association of Meteorology, Transactions, Oslo 1948*, v. 2, **1950.** p. 158–163. Mimeographed. **DWB**—The authors have analyzed a number of charts (which are given in the text). Some show that a marked breakdown of the upper flow pattern is accompanied by a complete occlusion in the layers near the ground and some show that no change in flow pattern is observed although a whole series of frontal disturbances have occluded. *Subject Headings:* **1. Dynamics of the atmosphere 2. Upper air flow pattern.**—*I.L.D.*

3.5–137 551.511:551.557.2:551.509.312

Fulks, J. R., **Some aspects of non-gradient wind flow.** U. S. Weather Bureau, Analysis Center [n.d.]. 28 p. 2 figs., 2 tables, 6 refs., 21 equations. **DWB**—The factors which may contribute to flow across the isobars are analyzed and those nonfrictional forces considered theoretically. Computations are made of the spatial variation of pressure gradient force at right angles to the isobars; the importance of nonfrictional cross isobar motion toward realization of energy of the solenoidal field is also discussed. It is concluded that these nonfrictional effects are a factor in the development and maintenance of both cyclonic and anticyclonic systems as well as in the associated convergence and divergence. *Subject Headings:* **1. Differential kinematics 2. Nongradient wind flow.**—*M.R.*

3.5–138 551.511

Fultz, Dave, **Non-dimensional equations and modeling criteria for the atmosphere.** *Journal of Meteorology*, 8(4):262–267, Aug. **1951.** 16 refs., 12 equations. **MH-BH**—The philosophy of expressing basic equations in nondimensional form, in order to facilitate similarity between models and natural conditions, is discussed at length. The author proposes a new dimensionless parameter similar to the Reynolds number and the Froude number, namely the Rossby number, to represent $U/A\Omega$ where U is a relative velocity, A the radius of the earth and Ω the magnitude of basic rotation. This Rossby number "Ro" will be a parameter expressing the influence of rotation. Thus, the nondimensional equations of motion will have only three parameters, Ro, Re and F, and the size of the system has no effect. *Subject Headings:* **1. Rossby number, Ro 2. Dimensionless equations 3. Equations of motion.**—*M.R.*

3.5–139 551.511

Hsu, E. H., **A general equation of horizontal mass divergence in the atmosphere.** *Journal of Meteorology*, 8(6):395–397, Dec. **1951.** 10 refs., 13 equations. **MH-BH**—An equation, which neglects only friction, is derived from the general equation of motion. It contains 14 terms, which are listed and named; 5 are negligible. Applications are given to gradient flow, geostrophic flow and a circular symmetric vortex. *Subject Headings:* **1. Divergence 2. Equations of motion.**—*C.E.P.B.*

3.5–140 551.511:551.543.1

Stolov, Harold L., **The semidiurnal tidal oscillation of the earth's atmosphere.** *American Journal of Physics*, 19(7):403–410, Oct. **1951.** 4 figs., 4 tables, 16 refs., 17 equations. **DWB**—The semidiurnal barometric fluctuation with maxima at about 10 a.m. and 10 p.m. is regarded as an atmospheric tide. The pressure variations at any station are shown to be made up of four sinusoidal pressure waves of which the 12-hour period is the most important. The expression of the semidiurnal wave, developed by SIMPSON, which can be represented by the sum of two sinusoidal components, one depending on local time and one on Greenwich time, is presented. The resonance theory of atmospheric tides is used to explain the fact that the solar influence on the semidiurnal pressure oscillation is much greater than that of the lunar. *Subject Headings:* **1. Dynamics of the atmosphere 2. Semidiurnal pressure waves 3. Atmospheric tides 4. Resonance theory.**—*I.L.D.*

GENERAL CIRCULATION

(*See also items:* 3.5–6, 3.5–8 to 3.5–10, 3.5–224, 3.5–225)

3.5–141 551.513:551.583.3

†Flohn, Hermann, **Allgemeine atmosphärische Zirkulation und Paläoklimatologie.** [General atmospheric circulation and paleoclimatology.] *Geologische Rundschau*, 40(1):153–178, **1952.** 7 figs., 49 refs. **DLC**—After a description of the existing 3-dimensional circulation in relation to land and sea distribution, the circulation in the Pleistocene is reconstructed. The Northern Hemisphere ice sheets correspond with the quasi-stationary upper troughs in the meridional type of circulation, and the contraction of the subtropical dry belts also agrees with an exaggerated meridional type. Thus the Ice Age was marked by strengthened meridional circulation and weaker west winds. Lowering of temperature (5°C generally, 4°C in tropics) and combined effect of mountain building and variations of solar radiation especially in ultraviolet, are also considered in this brief summary of the whole problem of climatic changes. *Subject Headings:* **1. Atmospheric circulation 2. Paleoclimatology.**—*C.E.P.B.*

3.5–142 551.513:551.557.2(4)

Great Britain. Meteorological Office, **Meteorological Office discussion. Winds in the stratosphere over Great Britain.** *Meteorological Magazine*, London, 81(955):14–18, Jan. **1952.** 6 refs. **DWB**—T. H. Kirk discussed paper by E. Hovmöller (*see item* No. 2.5–66 in May 1951 *Meteorological Abstracts*) and generalized his results with recent British work. A number of other speakers took part. *Subject Headings:* **1. Upper air winds 2. General circulation 3. British Isles. I. Kirk, T. H.**—*C.E.P.B.*

3.5–143 551.513

Hutchings, J. W., **The winter jet-stream in the Southern Hemisphere.** *Weather*, 7(3):73–77, March **1952.** 2 figs., table, 6 refs. **DWB**—Recent data confirm meridional cross section in Southwest Pacific (*see item* No. 7–40 in July 1950 *Meteorological Abstracts*) showing a jet stream in about 28°S. Winter jet is well-defined and steady without fronts, mean speed 105–110 knots. Illustrated by cross section Auckland-Guadalcanal and chart, July 27, 1945, showing jet of about 155 knots. *Subject Headings:* **1. Cross sections 2. Jet stream 3. Southwest Pacific.**—*C.E.P.B.*

3.5–144 551.513:551.507(99)

Priestley, C. H. B., **Air circulation and the Antarctic.** *Australian Journal of Science*, 10(5):129–131, April **1948.** **DLC**—A general discussion of atmospheric circulation in various latitude zones, followed by an argument for permanent meteorological stations or bases in the Antarctic and the elements to be observed and reported by these bases. *Subject Headings:* **1. Antarctic weather stations 2. General circulation.**—*M.R.*

3.5–145 551.513(98)

Rodewald, Martin, **Zirkulationsformen in der Arktis.** [Circulation forms in the Arctic.] *Polarforschung*, 3(1):75–79, **1951.** 2 tables, 10 refs. **DWB**—The new Arctic stations have shown that the pressure systems are more complex than was formerly thought. The deep cold air center is most often over Baffin Land, very rarely over Greenland. The normal position of the low at 5 km is also Baffin Land. Relation of temperature variations in polar cap to circulation in mid latitudes discussed, also position and variations of polar high and the types of synoptic development found. *Subject Headings:* **1. General circulation 2. Arctic.**—*C.E.P.B.*

3.5–146 551.513.1:532.5

Dedecker, Paul, **Sur le théorème de la circulation de V. Bjerknes et la théorie des invariants intégraux.** [V. Bjerknes' theorem of circulation and the theory of integral invariants.] *Belgium, Institut Royal Météorologique, Miscellanées*, Fasc. 36, **1951.** 63 p. equations. **DWB**—This highly mathematical discussion of the motion of baroclinic fluids aims to show how two Lagrangian propositions involving kinetic and potential energy can be related to the theory of integral invariants. Pt. 1 reviews the properties of the calculus of

variations which enter into the theorem of conservation of the circulation and HELMHOLTZ's theorem that lines of circulation are displaced like lines of flow. Pt. 2 applies BATEMAN's method in relating these general theorems to physical hydrodynamics and the calculation of two theorems by V. BJERKNES and W. THOMSON on variations of the circulation. An appendix describes the application of the variation method to the hydrodynamics of viscous fluids. *Subject Headings:* **1. Atmospheric circulation 2. Hydrodynamics.**—*C.E.P.B.*

3.5–147 551.513.1

Great Britain. Meteorological Office, **Meteorological Office discussion. Blocking action as a factor in the general circulation.** *Meteorological Magazine*, London, 81(956):48–52, Feb. 1952. 4 refs. **DWB** Discussion of paper by D. F. REX (*see item* No. 2.2–68 in Feb. 1951 *Meteorological Abstracts*). F. E. LUMB opened the discussion by proposing an alternative explanation of blocking based on interrelation between pattern and underlying surface pressure, with special reference to Northwest Europe, Jan. 17–20, 1950. In the discussion DAVIS thought blocking was caused by air descending from 300 mb. Several others contributed. *Subject Headings:* **1. Blocking action 2. General circulation 3. Northwest Europe. I. Rex, D. F.**—*C.E.P.B.*

3.5–148 551.513.1:551.511:551.557.3

Starr, Victor P., White, Robert M. and Lorenz, Edward N., **Preliminary studies of the eddy momentum flux evaluated from observed wind soundings.** Massachusetts Institute of Technology, General Circulation Project, Report No. 5, Nov. 30, 1950. 18 p., diagrs., tables, equations, refs. **DWB** The eddy transport of the angular momentum of the atmosphere is studied on the basis of rawin observations over North America. The method for calculating the approximate momentum transport across latitude circles is discussed. The horizontal transport of angular momentum in the meridional direction in general corresponds with that expected from friction, except that the transports are rather large. In the case of the vertical eddy transport of angular momentum, a correlation was found between the zonal and vertical velocity components associated with eddies the size of cyclones which is in the right sense to account for a downward transport of angular momentum in middle latitudes. A statistical analysis of rawin observations indicated that they are biased in favor of weak winds at high levels. A model illustrating the effect of gradients in the cross-current eddy motions upon the geostrophic balance is presented. *Subject Headings:* **1. Eddy momentum flux 2. General circulation 3. Upper air winds. I. Massachusetts. Institute of Technology II. Contract AF 19-122-153.**—*From Author's Abstract.*—*I.L.D.*

ATMOSPHERIC DISTURBANCES

(*See also items:* 3.5–4, 3.5–8, 3.5–13, 3.5–14, 3.5–40, 3.5–41, 3.5–78 to 3.5–80, 3.5–136, 3.5–272)

3.5–149 551.515:551.509.317:551.511

Royal Meteorological Society, **Dynamical methods in synoptic meteorology.** *Royal Meteorological Society, Quarterly Journal*, 77(333):457–473, July 1951. 8 figs., table, 13 refs., 8 equations. **MH-BH** —The discussion in Jan. 1951 was opened by R. C. SUTCLIFFE with accounts of ROSSBY's barotropic theory of wave propagation in the zonal circulation and the recent British treatment of baroclinic development. E. J. SUMNER contributed notes on vertical stability and synoptic development and a test on 500 mb. charts of the forecasting value of ROSSBY's formula for the movement of long atmospheric waves, with inconclusive results. F. H. BUSHBY discussed CHARNEY and ELIASSEN's formula for prediction of changes in 500 mb contours and the computation of vertical velocity in the 100–500 mb. layer. Several other speakers took part. *Subject Headings:* **1. Forecasting techniques 2. Dynamic meteorology.**—*C.E.P.B.*

3.5–150 551.515:551.509.312:551.511

Royal Meteorological Society, **Dynamical methods in synoptic meteorology.** *Meteorological Magazine*, London, 80(946):112–114, April 1951. 6 refs. **DLC**—Discussion on Jan. 17, 1951. R. C. SUTCLIFFE described dynamical theories of atmospheric circulation.

E. J. SUMNER discussed vertical stability and tests of Rossby's wave formula. E. H. BUSHBY described tests of CHARNEY and ELIASSEN's method of predicting 500 mb contours. For more extensive report of this Royal Meteorological Society discussion *see* 3.5–149 above. *Subject Headings:* **1. Forecasting techniques 2. Dynamic meteorology.**—*C.E.P.B.*

3.5–151 551.515:551.551:656.7

U. S. Weather Bureau, **Causes and characteristics of thunderstorms and other atmospheric disturbances.** *U. S. Weather Bureau, Third Interim Report,* June **1951.** 27 p. 54 refs. **DWB**—A summary of important investigations already completed, in progress or to be undertaken under Public Law 657—80th Congress, which directed the Weather Bureau "to study fully and thoroughly the internal structure of thunderstorms, hurricanes, cyclones and other severe atmospheric disturbances, particularly the degree of turbulence within such storms. . . ." Particular studies mentioned are: the Thunderstorm Project, radar navigation and storm detection, turbulence studies (in storms), free air turbulence, tornadoes, cloud physics, icing of aircraft, hail, hurricanes, pressure jumps, thunderstorm electricity and thunderstorm forecasting. A chart shows the tornado and squall line project network in Kansas and Oklahoma. *Subject Headings:* **1. Thunderstorms 2. Atmospheric turbulence 3. Aeronautical meteorology 4. Atmospheric disturbances 5. Meteorological research. 6. U. S. Public Law 657.**—*M.R.*

3.5–152 551.515.1:551.509.3(02)

Bachurina, A. A. and Turketti, Z. L., **Usloviia obrazovaniia atmosfernykh frontov.** [Conditions for the formation of atmospheric fronts.], Leningrad, Gidromet. Izdat., **1950.** 71 p. diagrs., 12 refs., biblio. **DLC**—A seemingly popular rendition of the essential rules for calculating cyclogenesis, anticyclogenesis, frontogenesis, frontolysis and other synoptic-dynamic processes from the surface and constant level charts and standard aerological diagrams. Advective changes of pressure and temperature, dynamic changes and frontal changes in lower and upper troposphere are treated with amazing thoroughness for so concentrated a presentation. Fronts in the free atmosphere (upper fronts) are also considered. Many schematic and sample diagrams and charts are included. *Subject Headings:* **1. Dynamic meteorology 2. Synoptic forecasting 3. Textbooks.**—*M.R.*

3.5–153 551.515.1:551.577.3(794)

Jorgensen, Donald L., **A long-term fluctuation in early fall precipitation in California.** *American Meteorological Society, Bulletin,* 32(6):210–213, June **1951.** 3 figs., 10 refs. **MH-BH**—Ten-year moving means of September rainfall for the period 1860–1950 were calculated for 6 stations in California in order to study long-term fluctuations in early autumn rainfall in California. Stations in the central portion are marked by light rainfall from1860–1890 and from 1920 to 1950. During the intervening period rainfall was heavier. Fluctuations were not evident in the southern part of the state. The meteorological factors influencing rainfall, namely: cyclonic developments, upper cold lows and movement into the area of decadent tropical storms are discussed. *Subject Headings:* **1. Precipitation frequencies 2. Cyclonic activity 3. Long period records 4. California.**—*I.L.D.*

3.5–154 551.515.71 551.515.11

Schmitz, H. P. **Über die Bewegung des Druck- und Windzentrums atmosphärischer Hoch- und Tiefdruckgebiete.** [On the motion of the pressure and wind centers of atmospheric high and low pressure regions.] *Zeitschrift für Meteorologie,* 5(12):358–363, Dec. **1951.** 5 refs., 30 equations. **DWB**—The point of lowest (highest) pressure in a traveling cyclone (anticyclone) does not coincide with the point of no wind. Author examines the equations of motion and deduces the distance apart of the two centers and its changes as a function of the pressure and wind field, taking account of surface friction. *Subject Headings:* **1. Anticyclones 2. Depressions.**—*C.E.P.B.*

3.5–155 551.515.11

Bjerknes, Jakob A. B. and Holmboe, Jörgen, **On the theory of cyclones.** *Journal of Meteorology,* 1(1/2):1–22, Sept. **1944.** 22 figs., 2 tables, 9 refs., 53 equations. **MH-BH**—

Opens with a clear account of the factors of instability in waves at a surface of discontinuity and associated internal waves in a continuous medium. Authors investigate the mechanism of this association. The relations between horizontal divergence and the field of pressure are set out in equations and diagrams. Above a critical speed in the westerlies with wavy isobars divergence and divergence cause eastward displacement. With westerlies above this critical speed and increasing with height, and with easterlies increasing with height, incipient waves grow, owing to thermal asymmetry. Cyclones develop in these unstable regions and if symmetrical, tend to drift westwards, but in temperate latitudes eccentricity of the isobars and the upper wave pattern usually overcome this tendency causing westward motion. *Subject Heading:* **1. Cyclone theories.**—*C.E.P.B.*

3.5–156 551.515.2:532.593:550.342

Kammer, E. W., and Dinger, J. E., **Hurricane swell as a generator of microseisms.** *Journal of Meteorology*, 8(5):347–353, Oct. 1951. 12 figs., table, 11 refs. **MH-BH**—From records of seismographs on Bahamas and east coast of the United States, it is concluded that microseisms associated with hurricanes do not originate on ocean floor below center. Longer periods are associated with higher wind speeds and are half of swell period independent of water depth. Amplitude increases rapidly as storm approaches shore, but decreases much more slowly as it moves away. Dominant source of microseisms is standing waves on ocean bottom near shore. *Subject Headings:* **1. Hurricane tracking 2. Microseisms 3. Wind waves.**—*C.E.P.B.*

3.5–157 551.515.2:551.461.2

*§Leppik, Egon, **Die Sturmfluten in der Elbemündung in der ersten Hälfte des 20. Jahrhunderts.** [Storm floods in the Elbe estuary in the first half of the 20th century.] *Deutsches Gewässerkundliches Jahrbuch, Besondere Mitteilungen*, Hamburg, No. 1, **1950.** 2 v. 95 figs., 6 tables, 13 refs. **DWB** The theoretical and meteorological aspects of cyclonic storms in the North Sea area and of storm tides are taken up in detail, followed by a discussion of 40 cases of storm floods in the Elbe region (from Jan. 1901–Dec. 18, 1949). Volume II gives detailed data for each case and a comprehensive analysis of synoptic conditions, pressure and wind changes, etc. made by means of graphs and charts. *Subject Headings:* **1. Cyclonic storms 2. Storm tides 3. Elbe Region, Germany 4. North Sea.**—*M.R.*

3.5–158 551.515.2:551.46

Masuzawa, J., **Some examples of typhoons as a motive of variations of oceanographic conditions.** *Japan, Central Meteorological Observatory, Oceanographic Report*, 1(3):118–123, Sept. 1950. 6 figs., 3 refs., 3 equations. In Japanese, English summary p. 123. **DWB**—Meteorological and oceanographical observations carried out daily by research ships during the summer of 1949 revealed that when typhoons passed through the neighboring region the oceanographic conditions changed discontinuously from the sea surface to a depth of 200 m. These changes were caused by the inflow of different masses of water as a result of variation in the current system accompanying the typhoon. *Subject Headings:* **1. Typhoon influences 2. Oceanographic conditions.**—*I.L.D.*

3.5–159 551.515.2(263)

§Moore, Paul L. and Davis, Walter R. *(U. S. Weather Bureau, Miami, Florida)*, **A pre-season hurricane of subtropical origin.** *Monthly Weather Review*, 79(10):189–195, Oct. 1951. 9 figs., 7 refs. Remarks by Conrad Mook and William Malkin and reply by authors: *ibid.*, 80(3):45–46, March 1952 2 tables. **DWB**—In a detailed case history, surface and upper air synoptic elements which led to a hurricane in the western Atlantic in May 1951 are thoroughly examined and represented on charts. Author concludes that such pre-season hurricanes show different features from regular hurricanes of tropical origin and suggests that they be classified distinctively (Simpson's "subtropical cyclone" is mentioned). It is pointed out that although the described hurricane could be considered as precedent-setting in regard to its proximity to the U. S. coast, preseason and even midwinter hurricanes frequently occur over the subtropical Atlantic. *Subject Headings:* **1. Hurricanes 2. Subtropical hurricane formation 3. Western Atlantic Ocean. I. Mook, Conrad II. Malkin, William.**—*G.T.*

3.5–160 551.515.2(265/6)

Palmer, C. E., **On high-level cyclones originating in the tropics.** *American Geophysical Union, Transactions,* 32(5):683–696, Oct. **1951.** 14 figs., 2 tables, 15 refs. **DWB**—Two weather situations (June 1946 and March 1949) over the southern North Pacific are represented on charts at various altitudes up to the 300 mb level and analyzed as to origin and progress of cyclonic development. Author warns about generalizing the application of Palmer's interpretation of cyclonic development and seeks a new approach to the problem. In reference to the two situations discussed, he finds that cyclonic circulation originates above 30,000 ft between 15°N and 10°N where it remains stationary for very long periods before moving on to higher latitudes and appearing on 500 mb or lower contour maps as a cold low. *Subject Headings:* **1. High-level cyclones 2. Tropical meteorology 3. Cold lows 4. Tropical Pacific.**—*G.T.*

3.5–161 551.515.2:551.557.2(52)

Uwai, K., **On the typhoons and tropical cyclone-groups in 1950 (I). (Generation and movement of tropical storms at the 700 mb surface.)** *Journal of Meteorological Research,* Tokyo, 3(12):417–430, Sept. **1951.** figs., 17 refs., 5 equations. In Japanese, English summary p. (25)–(26). **MH-BH**—The mechanism of the generation of tropical storms, their motions, inclination, change of the axis of vertical motion and its relation to the motion of the storms, variation in the streamline structure and its relation to storm development and distributions of the generating places were studied at the 700 mb level by applying streamline analysis to radiosonde and aircraft observations. A detailed study of a number of typhoons and tropical storms occurring off Japan is made. *Subject Headings:* **1. Typhoon mechanics 2. Tropical cyclones 3. Streamline analysis 4. Japan.**—*I.L.D.*

3.5–162 551.515.21(52):551.511

Hashimoto, M., **On the movement of typhoon.** *Journal of Meteorological Research,* Tokyo, 3(7):242–246, May **1951.** 4 tables, 4 refs., equations. In Japanese, English summary p. (17). **DWB**—Typhoons are steered by the field current with vorticity $\zeta=\frac{\partial^2\psi}{\partial x'^2}+\frac{\partial^2\psi}{\partial y'^2}$ so that $y=\frac{\zeta_0}{\beta}\left(1-\cos\frac{\beta R}{2\sqrt{2}}\right)t+\frac{2\sqrt{2}}{\beta R}V_0\sin\frac{\beta R}{2\sqrt{2}}t;V_0=\frac{\zeta_0 R}{2\sqrt{2}}\sin\frac{\beta R}{2\sqrt{2}}t+V_{00}\cos\frac{\beta R}{2\sqrt{2}}t$, where y is the y-coordinate of typhoon; β=latitudinal variation of the Coriolis parameter; R=radius of the typhoon. *Subject Headings:* **1. Typhoon mechanics 2. Typhoon tracks 3. Dynamics of the atmosphere.**—*Author's abstract.*

3.5–163 551.515.23(265)

§Cressman, George P., **The development and motion of typhoon "Doris," 1950.** *American Meteorological Society, Bulletin,* 32(9):326–333, Nov. **1951.** 14 figs., 13 refs., 5 equations. **MH-BH**—A detailed history of a typhoon which originated at a very low latitude (5°–6°N) near Truk early in May 1950, and moved with an erratic course toward Guam and Iwo Jima. Discussion is supported by charts on the synoptic situation and cloud distribution and a table of pressure changes. Several conclusions are drawn as to the general nature of a typhoon and significant features of the reported case indicated, such as development of the storm from two centers, unusually low latitude of formation, oscillation of the cyclone, motion to the north and others. *Subject Headings:* **1. Typhoon mechanics 2. Typhoon tracks 3. Western Pacific Ocean.**—*G.T.*

3.5–164 551.515.23:551.506.3(265)

Starbuck, L., **A statistical survey of typhoons and tropical depressions in the Western Pacific and China Sea area from observations and tracks recorded at the Royal Observatory, Hong Kong from 1884 to 1947.** *Hong Kong, Royal Observatory, R.O.T.M.* 4, **1951.** 10+p. 41 charts. Price $12. **DWB**—A careful, statistical study of 50 years of typhoon tracks in the area bounded by latitudes 5°N to 30°N and longitudes 105°E to 150°E and of 60 years of Hong Kong typhoons (winds of gale force or greater in that city). The bulk of the report consists of excellent typhoon charts showing monthly tracks, frequency, abnormal and typical

tracks, and a characteristic pressure pattern conducive to typhoon genesis. Remarks and diagrams illustrating extent of gales, pressure, precipitation and sequence of wind directions are included. *Subject Headings:* **1. Typhoon statistics 2. Typhoon tracks 3. Long period records 4. Western Pacific Ocean 5. China Sea. I. Hong Kong. Royal Observatory.**—*M.P.K.*

3.5–165 551.515.3

Rossmann, Fritz, **Das Bewegungsgesetz der Wolkentromben.** [The law of motion of cloud spouts.] *Naturwissenschaftliche Rundschau*, 4(8):337–342, Aug. **1951.** 10 figs., 7 refs. **DWB**—Discusses the dynamics of spouts. When the weight of hail or graupel overcomes the temperature excess of the rising air, the ascending motion is reversed from above downwards. If the descending current reaches the ground, the resulting divergence causes a strong fall of pressure and a downward acceleration. Several examples are analyzed. The "foot" of a waterspout is explained as the paraboloid ejection of air and spray from a cup-shaped depression in the water surface which is due to the thrust of the descending air. *Subject Heading:* **1. Waterspouts.**—*C.E.P.B.*

3.5–166 551.515.3(47)

Vasil'ev, V. I., **Smerch v Puchezhskom raïone Ivanovskoĭ oblasti.** [A wind spout in the Puchezh district in Ivanovo Region.] *Priroda*, Moscow. 40(10):52, Oct. **1951.** fig. **DLC**—The whirlwind was observed on July 15, 1950 at 13:20 hours. Its appearance and passage are described. It uprooted trees of a thickness of 40 cm and carried them 70–100 meters. Light winds and rain followed the storm. A photograph of the whirlwind is given. *Subject Headings:* **1. Whirlwinds 2. Ivanovo Region, U.S.S.R.**—*I.L.D.*

3.5–167 551.515.4

Aniol, Rudolf, **Mittlere Zahl der Tage mit Gewitter in Süddeutschland.** [Average number of days with thunderstorm in southern Germany.] *Germany, Deutscher Wetterdienst in der US-Zone, Mitteilungen*, 1(10), June **1951.** 18 p. 3+tables. **MH-BH**—Tables of monthly mean frequencies of days with thunder are given for several hundred stations by provinces. Standard period 1911–1940; series covering shorter periods could not be corrected to standard owing to very local distribution. *Subject Headings:* **1. Thunderstorm frequencies 2. Southern Germany.**—*C.E.P.B.*

3.5–168 551.515.4:551.501.8(048)

Die Entwicklung von Niederschlagszellen in einem Gewitter. [Growth of precipitation cells in a thunderstorm.] *Umschau*, Frankfurt a.M., 50(22):683, Nov. **1950.** 3 figs. **DLC**—Summary of the article "Radar measurements of the initial growth of thunderstorm precipitation cells" by G. R. Hilst and G. P. MacDowell, with some of the figures reproduced. For abstract of the original article *see items* No. 6–47 in June 1950 and No. 2H–174 in Aug. 1951 *Meteorological Abstracts*. *Subject Headings:* **1. Thunderstorm structure 2. Vertical velocity 3. Radar storm detection 4. Precipitation cells 5. Summaries.**

3.5–169 551.515.41

Byers, Horace R. and Braham, Roscoe R., Jr., **The structure and dynamics of the thunderstorm.** (In: **Thunderstorm electricity.** Chicago. University. Dept. of Meteorology, Oct. **1950.** p. 3–27. 5 figs., 5 tables.) **DWB**—A review of the most recent knowledge on the development and structure of thunderstorms. Authors discuss the life cycle of thunderstorms which includes the dynamics of the cumulus, mature and dissipation stages; the distribution of rain, snow and hail in thunderstorms; the thermodynamics of entraining of environmental air in the updraft of a convective cloud; the characteristics of thunderstorm weather near the surface (rainfall pattern, wind field, air temperature, surface pressure and relative humidity); electric fields in thunderstorms; the growth of thunderstorms as disclosed by radar; and the causes and effects of vertical shear. Statistical data on the frequency distribution of rain, snow and hail at a given altitude and on the average speeds of drafts measured at different flight levels are given. *Subject Headings:* **1. Thunderstorm structure 2. Thunderstorm dynamics.**—*I.L.D.*

3.5–170 551.515.41:551.576.11

Vývoj kumulonimbů. [Development of cumulonimbus.] *Meteorologické Zprávy*, 4(5/6):129, **1950.** In Czech. **MH-BH**—Synopsis of an article published in *Annalen der Meteorologie* (p. 345, 1948), in which H. WICHMANN presents a review of his own book "Grundprobleme der Physik des Gewitters" [Basic problems of the physics of thunderstorms] published in Wolfenbüttel in 1948. (*See item* 7–49 in July 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Thunderstorms 2. Cumulonimbus clouds 3. Summaries. I. Wichmann, Heinz.**

3.5–171 551.515.42:581.5(675)

*Goedert, P., **Répartition géographique des orages au Congo Belge en 1945.** [Geographical distribution of thunderstorms in Belgian Congo in 1945.] *Belgian Congo, Service Météorologique, Bulletin*, No. 1:17–31, Jan. **1951.** map, 2 tables, 6 refs. In French, French, Dutch, English and German summaries p. 17. Mimeographed. **DWB**—Thunderstorms are classified as (a) heat or convective, (b) air mass, and (c) cyclonic or hail type. Most of those recorded in the Belgian Congo were convective type (a). Most of them (56%) occurred in the afternoon or at night (between 1300 and 0530 GMT) and 12% occurred from 1300–1500 GMT. Their geographic distribution is shown on a chart in respect to phytogeographic conditions. Data are given for 39 places, with number varying from 1–128. The greatest number (117–128) occurs in the Central Depression, the least (1–2) on the high plateaus of Katanza. *Subject Headings:* **1. Thunderstorm distribution 2. Phytogeography 3. Belgian Congo.**—*M.R.*

3.5–172 551.515.42(437):551.577.37

§Konček, Mikuláš, **Silné dažde a Búrky na východnej Morave a na Slovensku v noci na 20. a na 22. septembra 1949.** [The torrential rains and thunderstorms in eastern Moravia and Slovakia during the nights of September 20 and 22, 1949.] *Meteorologické Zprávy*, 4(1/2):4–6, **1950.** 7 figs. **MH-BH**—In the late evening of September 19 and 21, 1949, two thunderstorms moved at a speed of about 25 km/hr over southeastern Moravia and western Slovakia and resulted in a total rainfall of more than 100 mm. The general weather condition was characterized by high pressure and cold continental air over Russia and slightly lower, evenly distributed pressure and comparatively cold, maritime air over Central Europe. The passage of very warm tropical air masses from the Mediterranean, interrupted by comparatively warm polar air from the ocean, caused the two thunderstorms, separated by a temporary feebly developed high. A series of isohyetal charts, and surface and upper air synoptic charts accompany the article. *Subject Headings:* **1. Thunderstorms 2. Excessive rainfall 3. Czechoslovakia.**—*G.T.*

RADIATION AND TEMPERATURE

RADIATION

(*See also items:* 3.5–34, 3.5–57, 3.5–102, 3.5–112, 3.5–273)

3.5–173 551.521 551.521.64:612

Buettner, Konrad, **Radiation effects on man in space.** *American Meteorological Society, Bulletin*, 32(5):183–185, May **1951.** 9 refs. **MH-BH**—The following types of radiations in space are discussed: 1) cosmic ray heavy primaries; 2) cosmic ray showers and cosmic radio microwaves of galactic and solar origin; 3) hard solar X-rays and 4) Takata reaction which presumably is the result of penetrating ionizing solar radiation. The Takata reaction was not confirmed by BUETTNER. *Subject Headings:* **1. Solar radiation 2. Cosmic radiation 3. Physiological climatology 4. Takata reaction.**—*I.L.D.*

3.5–174 551.521.1:551.501.4

Demianczuk, P. P., **Nota o całkowitym promieniowaniu słonca.** [Brief note on total amount of solar radiation.] *Gazeta Obserwatora PIHM*, Warsaw, 4(1):9–10, Jan. **1951.** 3 tables, equations. **DLC**—A new method of expressing mathematically the mean values of solar radiation for individual months of a certain period is introduced and applied to records for Gdynia and Warsaw (1928–1937) and to records for Gdansk (1932–1937). *Subject Headings:* **1. Solar radiation 2. Radiation measurements 3. Poland.**—*A.M.P.*

3.5–175 551.521.1:621.31

Moorehouse, C. E., **Power from solar radiation.** *Electrical Engineer and Merchandiser*, Melbourne, 28(3):75–77, June 15, **1951. DLC**—An account of basic principles, history and future prospects of the utilization of solar energy is given in general terms. Variable output is mentioned as major drawback but "the prospect of obtaining 50–70 megawatts per square mile for several hours a day in a district such as the Victorian Mallee is undoubtedly an attractive one." *Subject Headings:* **1. Solar radiation 2. Solar energy utilization 3. Electric power.**—*G.T.*

3.5–176 551.521.11:551.581(493)

Nicolet, Marcel and Dogniaux, R., **La détermination du climat de la radiation par la mesure de la durée de l'insolation.** [Determination of the radiation climate by measuring the duration of insolation.] *Geofisica Pura e Applicata*, 20:67–76, July/Dec. **1951.** 3 figs., 2 tables, 2 refs., 18 equations. In French, French and English summaries p. 67. **MH-BH**—At Uccle the Dept. of Radiation of the Meteorological Institute of Belgium uses two actinographs connected to Feussner-Linke actinometers, four solarigraphs (Moll-Eppley) and two diffusographs. Theory, methods of exposure and computation and some of the studies being carried out are described. For determining the "solar climate" the annual variation of direct, global and sky radiation and the duration of sunshine should be calculated from continuous records and improved formulas such as are presented here used rather then the less precise classical ones. *Subject Headings:* **1. Solar climate 2. Actinometric observation techniques 3. Insolation 4. Uccle, Belgium.**—*M.R.*

3.5–177 551.521.13

Houghton, Henry G., **The solar constant.** *Journal of Meteorology*, 8(4):270, Aug. **1951.** 7 refs. **MH-BH**—Recomputation of the solar constant gives a value of 1.952 ly/min (g cal. cm^{-2} min^{-1}) which is not far from the value of 1.946 based on Smithsonian data for 1924–1939. The latter value was considered to be 2.4% too high due to scale error, but two other corrections (for ultraviolet and infrared radiation) nearly balance the scale error. Thus 3 errors seem to cancel out, leaving 1.95 as very close to "true" solar constant. *Subject Headings:* **1. Solar constant. I. Smithsonian Institution.**—*M.R.*

3.5–178 551.521.3:69

Dirmhirn, Inge and Sauberer, Franz, **Die Bedeutung der diffusen Himmelsstrahlung im Bauwesen. I. Teil: Freier Horizont.** [The importance of diffuse sky radiation in building design. Pt. I. Free horizon.] *Wetter und Leben*, 3(8):178–183, Aug. **1951.** 5 tables, 10 refs. **MH-BH**—Diffuse sky radiation is an important but neglected factor in lighting and heating buildings. Table 1 gives monthly means in cal/cm^2 for cloud amounts 0–10, heights 200–3000 m., on horizontal surfaces. Amounts on vertical walls facing N, E, S, W, are tabulated for clear and overcast days and their importance emphasized. *Subject Headings:* **1. Sky radiation 2. Building construction.**—*C.E.P.B.*

3.5–179 551.521.3:546.17

Goody, R. M., and Wormell, T. W., **The quantitative determination of atmospheric gases by infra-red spectroscopic methods. I. Laboratory determination of the absorption of the 7.8 and 8.6μ bands of nitrous oxide with dry air as a foreign gas.** *Royal Society of London, Proceedings, Ser. A*, 209:178–196, **1951.** 8 figs., 2 tables, 16 refs., 8 equations. **DWB**—Accurate measurements with a rocksalt spectrometer were made to determine absorption in the 7.8μ band by commercial nitrous oxide mixed with dry air at pressures of 5 mm Hg to 1 atmosphere. Pressure effects and shape of wings of absorption lines are discussed and a theoretical relation to product of total pressure and amount of absorbing material is confirmed. The observed effect of absorption on temperature is compared with theory. Some measurements in the 8.6μ band are also discussed. *Subject Headings:* **1. Atmospheric absorption 2. Nitrogen compounds.**—*C.E.P.B.*

3.5–180 551.521.3:551.575

Kobayashi, A., **On the transmissibility of light through a cloud [of] particles. (For the wave-lengths from 4320 Å. to 9500 Å.)** *Meteorological Society of Japan, Journal, 2nd Ser.*,

29(5):139–146, May **1951.** 4 figs., 3 tables, 5 refs. In English, English and Japanese summaries p. 139, 147. **MH-BH**—Fogs were produced artificially in a cloud chamber and transmission of light of various wave lengths measured. Low pressure steam gave maximum transmission (0.4) at 4700 Å and minimum (0.3) at 5050. Fog from a water sprayer (mean diameter .02 mm) showed maximum (0.4) at 4700 and a broad minimum (0.3) from 5500–6500 Å. Tobacco smoke showed maximum transmission (0.4) at 4800 Å and minimum (0.28) at 5200 followed by a steady increase to 0.6 at 9500. Neither Rayleigh's nor King's scattering formula applied. *Subject Headings:* **1. Transmission coefficients 2. Fog.**—*C.E.P.B.*

3.5–181 551.521.3:535.3

Kuznetsov, E. S., **Luchistoe ravnovesie gazovoĭ obolochki, okruzhaiushcheĭ absoliutno chernuiu sferu.** [Radiation balance of a gaseous envelope surrounding an absolutly black sphere.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geofiz.*, No. 3:69–93, **1951.** 114 equations. **DLC**—The problem of the distribution of temperature in an absorbing medium surrounding an absolute black body is considered. The integral equation for determining the distribution of temperature both in the case of a constant and variable coefficient of extinction is developed. In addition to instances of an unbounded environment there are also analyzed instances of environments bounded outwardly by spherical boundaries upon which a given radiation intensity impinges. *Subject Headings:* **1. Radiation balance 2. Extinction coefficients.**—*Author's abstract.—I.L.D.*

3.5–182 551.521.3:535.34

†Luch, Werner, **Über die Gültigkeit des Lambertschen und des Beerschen Gesetzes.** [On the validity of Lambert's and Beer's laws.] *Zeitschrift für Naturforschung*, Tübingen, 6a(4):191–202, April **1951.** graphs, 95 refs., equations. **DLC**—The entire literature on the subject of spectral absorption is reviewed and criticized and formulas and nomograms presented which can be used in determining the absorption of any band in a continuous or overlapping spectrum. Extinction coefficient curves for $\beta = 0.8$, 1.0, 1.25, 1.5 and 2.0 are calculated from tables of Bessel Functions following a linear law; those for $\beta = 0.6$ down to 0.05 follow an asymptotic formula. These nomograms are useful in calculating absorption from spectral broadening in the upper atmosphere. *Subject Headings:* **1. Absorption of radiation 2. Spectral broadening 3. Lambert's law 4. Beer's law.**—*M.R.*

3.5–183 551.521.3 551.524.4 551.551 551.574.4

Priestley, C. H. B., **Turbulent-transfer coefficients near the ground.** *Royal Meteorological Society, Quarterly Journal*, 78(335):107, Jan. **1952.** Pasquill, F., **Eddy diffusion of heat and water vapour.** *Ibid.*, p. 108–109. Rider, N. E. and Robinson, G. D., Reply to C. H. B. Priestley and F. Pasquill, *ibid.*, p. 109–111. 2 tables. **DWB** PRIESTLEY and PASQUILL discuss evidence of RIDER and ROBINSON (*see item* No. 2.10–104 in Oct. 1951 *Meteorological Abstracts*) that eddy transfer coefficients of heat and water vapor are equal near the ground. PASQUILL questions aerodynamic estimates. *Subject Headings:* **1. Energy exchange. I. Pasquill, F.**—*C.E.P.B.*

3.5–184 551.521.3:551.521.61

Shekhter, F. N., **K vychisleniiu luchistykh potokov tepla v atmosfere.** [The calculation of radiational heat flux in the atmosphere.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 22(84):38–51, **1950.** 5 figs., 3 tables, 15 refs., 26 equations. **DLC**—The author discusses briefly the various principal methods for calculating radiational flux, and then discusses in detail the absorption of infrared radiation in the atmosphere by H_2O and CO_2 and the calculation of the flow of radiant energy. On the basis of his theoretical analysis of the measurement of radiational flux he constructs a diagram for calculating the flux of radiant energy. Calculations of counter radiation made with this diagram are compared with those obtained by other methods to the advantage of the former. *Subject Headings:* **1. Radiation flux 2. Atmospheric absorption 3. Radiant energy transfer.**—*I.L.D.*

3.5–185 551.521.3:629.13

Spillmann, Werner, **Der Wärmeaustausch durch Strahlung an fliegenden Körpern.** [The heat exchange by radiation in flying bodies.] *Zeitschrift für angewandte Mathematik und*

Physik, 2(6):470–484, 1951. 6 figs., 29 equations, 7 refs. English summary p. 484. **MH-BH**—Discusses the heat economy of an object flying at great heights. Factors considered are solar constant, absorption of radiation by the atmosphere (0–14 km), radiation of individual layers of the atmosphere, of cloud sheets and of the earth, and heat loss by radiation from a pressurized aircraft cabin. Numerical results shown graphically. Results also applied to heating technique of glasshouses, swimming baths, etc. *Subject Headings:* **1. Heat balance 2. Airplanes.**—*C.E.P.B.*

3.5–186 551.521.3

*Yamamoto, Gi-ichi and Onishi, Gaishi, **Appendix in our paper on absorption coefficient of water vapour in the far infra-red region.** *Tôhoku University, Science Reports, 5th Ser., Geophysics*, 3(2):73–77, Sept. 1951. table, 3 refs. **DWB**—Positions and relative intensities are given for the absorption lines between $\nu = 0.78/\text{cm}^{-1}$ and $\nu = 963.20/\text{cm}^{-1}$. (*See item* No. 2.11–98 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Solar radiation 2. Absorption by water vapor 3. Infrared region.**—*A.A.*

3.5–187 551.521.31:551.507.352:551.508.21

Fritz, Sigmund and MacDonald, Torrence H., **Measurements of absorption of solar radiation by clouds.** *American Meteorological Society, Bulletin*, 32(6):205–209, June, 1951. 4 figs., 5 refs. **MH-BH**—The radiation entering and leaving both the top and base of clouds was measured by means of aircraft equipped with pyrheliometers. The methods of measurement, the observations which were made at Madison, Columbia, Missouri and Washington, D. C. and the sources of error are discussed. The absorption values for Madison and Columbia obtained by the aircraft measurements are close to the computed values while those for Washington are considerably higher (an absorption value of 20%) as compared with the computed values (about 10%). *Subject Headings:* **1. Absorption by clouds 2. Airplane observations 3. Pyrheliometer measurements.**—*I.L.D.*

3.5–188 551.521.32:551.521.63

Słomka, Jan, **Kilka uwag o promieniowaniu nieba.** [Some comments on radiation from the sky.] *Gazeta Obserwatora PIHM*, Warsaw, 3(11):12–13, Nov. 1950. table. **DLC**—Comments on H. Lunelund's and S. Nordström's paper published in the Finnish geophysical periodical *Geophysica* No. 3, Helsinki 1948, describing the results of measurements of sky radiation carried out in Finland in clear weather (*see item* No. 7–54 in July 1950 *Meteorological Abstracts*). The author points out the importance of sky radiation in the ultraviolet wave length range, since at a 45° height of the sun the ultraviolet radiation constitutes more than half of the total radiation. *Subject Headings:* **1. Sky radiation 2. Ultraviolet radiation 3. Finland. I. Luneland, H. II. Nordström, S.**—*A.M.P.*

3.5–189 551.521.61:535.34

Willis, J. B., **The influence of slit-width on the shape and intensity of infrared absorption bands.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 4(2):172–180 June 1951. 2 figs., 3 tables, 10 refs., 6 equations. **MH-BH**—Making certain assumptions as to the shape of infrared absorption bands and the shape of the slit of the monochromator, expressions are obtained for the dependence on spectrometer slit-width of the intensity and half-width of absorption bands. Experimental data to confirm the accuracy of these deductions are presented. *Subject Headings:* **1. Infrared absorption spectrum 2. Infrared spectroscopy 3. Monochromators.**—*From author's abstract.*

TEMPERATURE

(*See also items:* 3.5–93, 3.5–108, 3.5–135, 3.5–183, 3.5–215, 3.5–231, 3.5–254)

3.5–190 551.524.1:551.508.26

Rusin, N. P., **Izmerenie vertikal'nogo gradienta temperatury v prizemnom sloe vozdukha dlia tseleĭ prikladnoĭ meteorologii i klimatologii.** [Measurement of the vertical gradient of temperature of the air near the ground for use in applied meteorology and climatology.]

Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy, No. 25(87):20–26, **1951.** 4 figs., table. **DLC**—Gradient air temperatures between 20 and 150 cm were measured by means of mecurial thermometers alone, by aspirated thermometers, thermocouples and resistance thermometers attached to a pole at the specified levels. The temperature gradients obtained by these different instruments are compared. The gradients obtained by means of mercurial thermometers, aspirated thermometers and resistance thermometers were very similar: those obtained with thermocouples differed considerably. Gradients obtained with a thermograph were not reliable for short periods. *Subject Headings:* **1. Vertical temperature gradient 2. Micrometeorology 3. Temperature instruments.**—*I.L.D.*

3.5–191 551.524.1

Schwind, M., **Mikroklimatische Beobachtungen am Wutaischan.** [Microclimatic observations on Wu Tai Shan.] *Erdkunde*, 6(1):44–45, Feb. **1952.** table. **DLC**—Summary of: Miscellaneous Reports of the Research Institute for Natural Resources, Tokyo, No. 12, 1948. Five temperature observations daily in May–June 1942 on East Peak (38°50′N, 113°E, 2670 m) and at mountain foot (982 m) 0–300 cm above ground are summarized. *Subject Headings:* **1. Mountain meteorology 2. Temperature microvariations 3. Wu Tai Shan, China.**—*C.E.P.B.*

3.5–192 551.524.3(4):551.465(261)

Heyer, E., **Wirkungen des Golfstroms auf die Temperatur in Mitteleuropa in milden Wintern.** [Effects of the Gulf Stream on the temperature of central Europe in mild winters.] *Zeitschrift für Meteorologie*, 4(11):337–342, Nov. **1950.** 6 figs. **MH-BH**—Positive relations are found between SW wind calculated from pressure differences Stockholm-Reykjavik and Horta-Reykjavik and departures from normal of monthly mean temperatures in 6 mild winters at Potsdam, in the same month (warm SW wind) and two months later (effect of warm drift current). The latter relation may be of use for long range forecasting. *Subject Headings:* **1. Temperature variations 2. Marine influences 3. Gulf Stream 4. Central Europe.** *C.E.P.B.*

3.5–193 551.524.32(52)

Ite, R. and Suzuki E., **A statistical study on winter air temperature in Tokyo (1st report).** *Journal of Meteorological Research*, Tokyo, 2(12):380–382, Dec. **1950.** 3 figs., table, equation. In Japanese, English summary p. (12). **DWB**—A statistical analysis of the mean annual temperature of Tokyo during Dec. to Feb. revealed 9- and 11-year periods in Jan. and 11-year periods in Feb. The level of significance was 5%. *Subject Headings:* **1. Winter temperatures 2. Temperature periodicities 3. Tokyo, Japan.**—*From author's abstract.*

3.5–194 551.524.32:551.509.33:551.506.3(43)

Trenkle, Hermann and Franke, M., **Über Beziehungen der Witterung aufeinanderfolgender Monate und Jahreszeiten.** [Relationships between the weather of succeeding months and seasons.] *Baden, Landeswetterdienst, Jahresbericht mit Abhandlungen*, **1949.** p. 42 63. tables, 12 refs. **DWB**—The temperature series for Berlin (1719–1884) and for Karlsruhe (1834–1939) were analyzed statistically in order to determine whether any statistical relationship exists between cold winter temperature and a preceding warm summer, and between a warm summer and a preceding cold winter. The author concludes that no statistically valid tendency of temperature development could be ascertained in the temperature series and that probabilities that vary with time cannot be used in forecasting. *Subject Headings:* **1. Temperature trends 2. Seasonal forecasting 3. Temperature data 4. Germany.** —*I.L.D.*

3.5–195 551.524.35

Nagao, T., **Standard deviation of monthly mean temperature.** *Journal of Meteorological Research*, Tokyo, 3(12):434–448, Sept. **1951.** numerous figs. In Japanese, English summary p. (27). **MH-BH**—The author calculated the standard deviation of monthly mean temperature near Japan and over the Northern Hemisphere in order to study its relationship to monthly

mean temperature. It was found that standard deviations increased towards the north, that the rate was large in winter and small in summer and that a frontal zone nearly coincides with the area of small standard deviations. Charts showing standard deviations of mean temperature for every month of the year and for summer and winter are given. *Subject Headings:* **1. Temperature variations 2. Northern Hemisphere 3. Japan.**—*I.L.D.*

3.5–196 551.524.33

Wahl, Eberhard, **On a seven-day periodicity in weather in the United States during April, 1950.** *American Meteorological Society, Bulletin*, 32(5):193, May **1951.** equations. **MH-BH**—An examination of spring temperature in Boston during 1879, and an April 1947 temperature record at Mitchel Field, N. Y. revealed a 7 day periodicity. The method of computation was as follows: a noticeable marked trend in temperature was eliminated for the period of April 2–29 by linear least squares and the residuals from the linear trend were subjected to harmonic analysis of a 7-day interval. *Subject Headings:* **1. Temperature periodicities 2. United States.**—*I.L.D.*

3.5–197 551.524.36(73)

Court, Arnold, **Coldest temperatures in the United States.** *Weatherwise*, 4(6):136–139, Dec. **1951.** 3 figs., tables. **DWB**—Frequency, time and place of occurrence of temperatures below −60°F in the United States are listed and analyzed and the special local circumstances associated with such record low temperature are discussed. *Subject Headings:* **1. Extreme temperatures 2. United States.**—*I.L.D.*

3.5–198 551.524.36:519.241

Court, Arnold, **Temperature frequencies in the United States.** *Journal of Meteorology*, 8(6):367–380, Dec. **1951.** 12 figs., 4 tables, 34 refs. **MH-BH**—A study based on frequency tabulations of unpublished hourly Jan. and July temperatures at 40 stations, 1935–39 (frequency graphs given). Standard deviations are mapped (Jan. 10–18°F, July 7–15°). Skewness (slight; negative in winter, positive in summer) and kurtosis (excess near mean) were computed for 20 stations and discussed. Curves are classified into 3 types (S.D. 8°F or less; S.E. exceeds 8°F, normal distribution; S.D. large, very platykurtic) and distribution of types mapped. Causes of variation are discussed; water is the most important factor. *Subject Headings:* **1. Statistical studies 2. Temperature frequencies.**—*C.E.P.B.*

3.5–199 551.524.37:551.584

Berliand, M. E., **Effektivnost' otkrytogo obogreva rasteniĭ pri zamorozkakh.** [Effectiveness of open heating of plants during frosts.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 23(85):28–29, **1951.** 4 figs., 3 tables, 12 refs., 12 equations. **DLC**—The Nikitorov model of heater, which uses petroleum, for open heating of plants is described and illustrated, and its heat balance is analyzed. A formula for determining the temperature of the lower atmospheric layer near a heater is developed. By means of this formula the heat effect of a system of heaters within a plantation of a given area is calculated, and the increase in temperature at various elevations above the ground and at varying distances from the heaters is given in tables. *Subject Headings:* **1. Agricultural climatology 2. Frost protection 3. Artificial climates 4. Microclimatology 5. U.S.S.R.**—*I.L.D.*

3.5–200 551.524.37:581.036.5(234.3)

Pisek, A., **Zur Kenntnis der Frosthärte alpiner Pflanzen.** [On the frost resistance of alpine plants.] *Naturwissenschaften*, 39(4):73–78, Feb. **1952.** 5 figs., table, 17 refs. **DWB**—In high mountains, bioclimatic conditions vary rapidly in short distances. Wind and föhn are important for their effect on protective snow cover. Measure of frost resistance was the temperature at which 15–20% of the plants were injured; it varied from −40°C (stone pine) to −10°C (chickweed); table given. Frost resistance has a marked annual cycle depending on temperature (hardening off in winter), snow cover and plant physiology. Dryness causes damage in southerly exposures; critical level lowest in winter. *Subject Headings:* **1. Frost damage 2. Plant resistance.**—*C.E.P.B.*

3.5–201 551.524.37:551.586.58

*Primault, B., (*Zurich, Meteorological Society*), **Les coiffes anti-gel et leurs répercussions sur le développement des ceps.** [Frost protection screens and their effect on the development of grape vines.] *Geofisica Pura e Applicata*, 20:186–196, July–Dec. **1951.** 10 figs., 2 tables, 2 refs. In French, French, German and English summaries p. 186. **MH-BH**—Microclimatic data obtained under straw and paper frost screens show that the straw is effective in reducing daytime temperature and keeping night temperatures above freezing, whereas paper covers increase the heat of mid-day and of frost at night. Under cloudy conditions the effects are the same sign but of lesser intensity than during clear weather. Effects on vegetation are shown in photographs, and temperature effects are shown in tables and charts for instances in April and May 1951 at Swiss agrometeorological experiment station, Zurich. *Subject Headings:* **1. Frost protection 2. Agricultural meteorology 3. Viticulture 4. Zurich, Switzerland.**—*M.R.*

3.5–202 551.524.37:551.583.13(492)

Visser, S. W., **On Easton's period of 89 years.** (*K.*) *Akademie van Wetenschappen te Amsterdam, Proceedings*, 53(2):172–175, **1950.** 7 refs. **DLC**—Easton (1917) found a 89-year period in occurrence of cold winters in western Europe, based on records from A.D. 760 to 1916. The author claims to have found a similar series of 89-year periods, each composed of 8 of the well-known 11-year sunspot cycle periods, based on Netherlands temperature data for 2½ centuries, and on older records which Easton published in 1928, which are continuous back to A.D. 1205, making 8 of the longer cycles. Each 89-year period is broken up into parts which, shown graphically, have some regularity, but also marked irregularity. *Subject Headings:* **1. Periodicities 2. Cold winters 3. Long period records 4. Weather cycles 5. Easton's cycles 6. Netherlands.**—*M.R.*

3.5–203 551.524.4:551.586:612

Lehmann, P., **Sperrschichteneinfluss auf das Bioklima.** [Influence of blocking layers on bioclimate.] *Angewandte Meteorologie*, 1(4):104–105, Jan. **1952.** 4 refs. **DWB**—At Treves a scale (1–9) of surface inversion—mist or cloud type—was compared for a year with body functions. Preliminary results given. *Subject Headings:* **1. Bioclimatology 2. Inversions.**—*C.E.P.B.*

3.5–204 551.524.7:551.542

Austin, J. M. and Shapiro, R., **Tropospheric and stratospheric temperature changes associated with pressure changes.** *Journal of Meteorology*, 8(3):191–195, June **1951.** 2 figs., 3 tables, 7 refs., equations. **DWB**—On the basis of 12 hour radiosonde data for North America, the authors investigate statistically the temperature and density changes accompanying pressure changes at the earth's surface. It is concluded that there is a physical basis for separating pressure changes into a component associated with the intensification of a pressure system and into a component associated with the motion of a pressure system. The motion component is accompanied by low level warming as pressure falls and by cooling as pressure rises. Low level temperature changes depend upon horizontal advection. The intensification component is associated with high level warming with pressure falls and cooling with pressure rises. *Subject Headings:* **1. Upper air temperatures 2. Pressure changes.**—*I.L.D.*

SOIL TEMPERATURE

3.5–205 551.525.4

Hausmann, Gisela, **Unperiodische Schwankungen der Erdbodentemperaturen in 1 m bis 12 m Tiefe.** [Unperiodic oscillations of soil temperature in depths of 1 to 12 m.] *Zeitschrift fur Meteorologie*, 4(12):363–372, Dec. **1950.** 4 figs., 4 tables, 8 refs. **MH-BH**—This work contains much material for Potsdam, 1894–1949. After describing the set-up, the mean annual extremes, dates and phase lags, recorded extremes and monthly means are tabulated and discussed. The irregularities in the daily mean curves 1894–1948 at 1 and 2 m are plotted and referred to "singularities" and the wave-like disturbance in summer 1907 is tabulated as an example. Finally, the duration of frost at ½ and 1 m (which occurred in 8 years) and extreme

minima are tabulated and discussed. *Subject Headings:* **1. Soil temperature variations 2. Singularities.**—*C.E.P.B.*

3.5–206 551.525.4:551.501.4:551.501.6

Nikitin, M. F., **K metodike prosmotra nabliudenii nad temperaturoĭ pochvy na malykh glubinakh.** [A method of checking soil temperature observations at small depths.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 25(87):88–92, **1951.** 5 figs., 2 tables. **DLC**—The author presents a method of analysis for detecting observational errors in soil temperature readings in working up meteorological observations and in the preparation of yearbooks. This method involves the construction of decadal thermopleths of the soil, writing out temperature gradients by depths and differences of soil temperature between periods of observation, and the construction of charts with gradients of maximum and minimum soil temperatures. *Subject Headings:* **1. Soil temperatures 2. Observational errors 3. Graphical presentation.**—*I.L.D.*

3.5–207 551.525.4

*Unger, Kurt, **Bearbeitung der Bodentemperaturen von Quedlenburg.** [Tabulation of the earth temperatures at Quedlenburg.] *Angewandte Meteorologie*, 1(3):85–90, Dec. **1951.** 2 figs., 6 tables. **DWB**—Mean daily 8 hr temperatures at surface and depths of 20, 50 and 100 cm 1938–47 are tabulated and plotted. The surface temperature shows a number of singularities which decrease with depth but are still partly visible with a few days lag at 1 m. Frost frequency also decreases with depth of 50 cm. The mean dates on which surface temperatures reach germination points of various seeds are tabulated. *Subject Headings:* **1. Soil temperatures 2. Quedlenburg, Germany.**—*C.E.P.B.*

3.5–208 551.525.4:551.506.3(437)

*Žemlová-Boušková, Věra, **Dlouhodobé průměry teplot půdy.** [Averages of soil temperature over long periods.] *Meteorologické Zprávy*, 4(1–2):24–34, **1950.** 9 figs., 4 tables. **MH-BH**—The National Meteorological Institute of Czechoslovakia has 20 stations at which soil temperature is measured. Extensive tables and charts give results from 4 such stations: Brno from 1931 to 1949, 0–200 cm; Libějovice, Tábor and Klatovy from 1924 to 1948, 0–100 cm. A detailed description of soil layers in these areas is added as well as indications regarding working methods. *Subject Headings:* **1. Soil temperature data 2. Czechoslovakia.**—*G.T.*

3.5–209 551.525.4

Zych, Stanisław, **Temperatura w powłoce Ziemi.** [Temperature of the earth's crust.] *Gazeta Obserwatora PIHM*, Warsaw, 4(3):3–5, March **1951.** 2 figs., table. **DLC**—The article gives internal temperatures of the earth at different depths and at different points; the geothermic scale. Some information on internal temperature of the earth in different regions of Poland is also presented. *Subject Headings:* **1. Earth temperatures 2. Thermal gradient 3. Poland.**—*A.M.P.*

ATMOSPHERIC PRESSURE AND WIND

PRESSURE

(*See also items:* 3.5–63, 3.5–87, 3.5–140, 3.5–204, 3.5–211)

3.5–210 551.54:551.311.17

Schell, I. I., **Stability and mutual compensation of relationships with the iceberg severity off Newfoundland.** *American Geophysical Union, Transactions*, 33(1):27–31, Feb. 1952. 4 tables, 8 refs. **DWB**—Previous studies of different authors show that a relationship exists between the air pressure gradient, Labrador–South Greenland and the iceberg severity off Newfoundland. The author gives a physical interpretation and makes a stability test of this relationship. Other relationships are also examined. A formula, based on data prior to 1927 and considering 4 factors, is derived with $r = 0.80$. This formula is tested for the period 1927–1951. A good agreement is found, especially for years with a small number of icebergs.

Subject Headings: **1. Atmospheric pressure 2. Icebergs 3. Correlations 4. Newfoundland.**—*A.A.*

3.5–211 551.543:551.547.3

Haurwitz, Bernhard, **Atmospheric oscillations.** New York University, College of Engineering, Contract AF 19(122)-49, Progress Reports, Nos. 122-04 to 122-08, April 14, Oct. 25, **1950;** Jan. 14, April 14, **1951.** 5 v. diagrs., graphs, tables, refs. **DWB**—In the first of these five Progress Reports (No. 122-04) effect of changes in solar radiation and consequent change in annual temperature range on the magnitude and distribution of pressure and the resulting atmospheric circulation over the globe are studied. Models are set up, first on the basis of uniform surface and then on the actual continent—ocean distribution by applying a postulated temperature range based on actual temperature range. The effect of zonal wind distribution on perturbation patterns is next considered and then the propagation of composite pressure and flow patterns treated in more detail. In the second report (No. 122-05) the effect of stability or lapse rate distribution in the atmosphere, of the periodic winds in the upper stratosphere induced by solar and lunar tides and the effect of magnetic storms on pressure in the mid-troposphere is discussed. In Report No. 122-06, the effects of temperature and wind variations on the free periods of an autobarotropic atmosphere are worked out. Both short period and long period oscillations are affected, and it is shown that the magnitude of propagation of these waves is in keeping with the period of the generating force and the pulses measured during (or after) the Krakatoa eruption and the explosion of the Great Siberian Meteor. Difficulties arise from sensitivity of the free period of these pulses to slight changes in temperature or zonal wind speed. The relation between geomagnetic variations and pressure changes in the mid-troposphere is shown to be very weak. In report No. 122-07, the formula is worked out for computing the effect of vertical structure and zonal wind distribution on the free oscillations of the atmosphere. Then the theory of thermally induced oscillations of the order of one day is developed by introducing the factor of vertical motion which MARGULES neglected and by integrating over the entire depth of the atmosphere. [Statistical studies were made of the relation between 3000m pressure variations and geomagnetic and solar phenomena; poor correlation was found.] In report No. 122-08, a three-dimensional model is set up for study of diurnal and semidiurnal pressure waves due to solar heating. It was found that the wave decreases from the equator toward the pole, and that its amplitude at 45°N is about one seventh that at the equator in keeping with observed variations. The theoretical semidiurnal wave did not agree so well with fact. Data for Aklavik, Point Barrow and Fairbanks for 1941 were studied to determine the correlation between changes in height of 700, 500, 400 and 200 mb constant pressure surfaces and number of days before or after a magnetically quiet or disturbed day. The height changes appeared to be less on quiet days than on adjacent days. No relation was found between disturbed days and height changes. Significance tests were applied to data and correlations. *Subject Headings:* **1. Atmospheric tides 2. Solar influences 3. Annual temperature variations 4. Diurnal temperature variations 5. Stratospheric winds. I. New York University. College of Engineering II. Contract AF 19(122)-49.**—*M.R.*

3.5–212 551.543.1

Bourguignon, R., **La pression atmosphérique au Congo Belge. Ie. partie. Diagrammes de la pression pour 20 stations (1946–1949).** [Atmospheric pressure in the Belgian Congo. Pt. 1. Diagrams of pressure for 20 stations (1946–1949).] *Congo Belge, Service Météorologique, Publication* No. 1, **1951.** 188 p. numerous figs. and tables. **DWB**—For 20 stations 3°38′N to 11°39′S, 12°25′ to 29°52′E mean curves are given for each month from barographs corrected by eye observations. Tables give mean at 4 observation hours and extremes. *Subject Headings:* **1. Diurnal pressure variations 2. Belgian Congo.**—*C.E.P.B.*

3.5–213 551.543.1 · 551.590.22

†Chapman, Sydney, **Atmospheric tides and oscillations.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 510–530. 16 figs., table, 112 refs.) **MH-BH, DWB**—History of investigation of lunar semidiurnal atmospheric tides is summarized and harmonic analysis, harmonic dial and methods of calculation described. Geographical distribution and annual variation of lunar atmospheric tides are illustrated.

The adiabatic lunar temperature variation (0.01°C at Batavia), tidal wind (1 cm/sec at Mauritius), height of ionosphere (1 km in E layer at Cambridge, England), lunar variation of cosmic rays (mesons originating at 18–20 km), and lunar daily variation of geomagnetic field due to ionosphere currents are described. Author then deals with solar semidiurnal oscillation and its annual variation. History of theory of atmospheric oscillations is set out beginning with NEWTON and including resonance theory initiated by KELVIN and present position due to PEKERIS, WEEKES and WILKES. Suggestions are made for future computing and theoretical work. *Subject Headings:* **1. Atmospheric tides 2. Lunar influences 3. History of meteorology.**—*C.E.P.B.*

3.5–214 551.543.1(262)

Jameson, H., **Diurnal variation of pressure in the Mediterranean area.** *Great Britain, Meteorological Office, Professional Notes*, No. 105, **1952.** 17 p. 23 figs. M.O. 524e. **DWB**—Twenty-four-hour and twelve-hour variations of pressure for each month were calculated from ships' observations for 7 areas in Mediterranean and compared with land stations, the results being plotted on harmonic dials. The 24-hour oscillation varies considerably from one area to another and from sea to land; it is related to land and sea breezes. The 12-hour oscillation is steadier, the extremes at sea average 52 minutes later than on land. Some 12-hour oscillations in tropical oceans are given for comparison. *Subject Headings:* **1. Diurnal pressure variations 2. Mediterranean Region.**—*C.E.P.B.*

WIND

(*See also items:* 3.5–9, 3.5–12, 3.5–66, 3.5–114, 3.5–117, 3.5–135, 3.5–137, 3.5–142, 3.5–148, 3.5–151, 3.5–161, 3.5–183, 3.5–219, 3.5–224, 3.5–227, 3.5–274)

3.5–215 551.551:551.524.4:551.571.4

Churinova, M. P., **O turbulentnosti v nekotorye dni s kuchevymi oblakami.** [Turbulence on certain days with cumulus clouds.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, 24(86):20–26, **1951.** 4 figs., 7 tables, 3 refs., equations. **DLC**—Temperature, humidity and wind soundings were made at 2 hour intervals at elevations from 0.2 to 3 km on several clear days and on one cloudy day (convective clouds). Richardson's number was calculated for every time interval and elevation. The mean vertical gradient of daily temperature and the daily march of turbulence during these two weather types are determined and discussed. *Subject Headings:* **1. Atmospheric turbulence 2. Cumulus clouds 3. Vertical temperature gradient 4. Richardson's number.**—*I.L.D.*

3.5–216 551.551:551.508.59

De Pasquale, Oreste, **Ricerche sperimentali sulla turbolenza atmosferica.** [Experimental research on atmospheric turbulence.] *Rivista di Meteorologia Aeronautica*, 11(1):10–28, Jan./March **1951.** 10 figs., 7 refs., equations. Italian, French, English and German summaries p. 10. **MH-BH**—After a brief review of the history of the study of turbulence (REYNOLDS, RAYLEIGH, BÉNARD and PRANDTL), there is a chapter on experiments on the lower layers of the atmosphere by means of pilot balloons and the limitations of this method; one on the use of captive balloons for the same purpose; then a method which avoids the limitations of the other two methods, involving the use of a new instrument called a turbograph and, finally, its adaptation to long range transmission by a special transmitter (turbi-sonde). Theory is developed in each case and equipment, records, etc. are illustrated by photographs and schematic diagrams. *Subject Headings:* **1. Atmospheric turbulence 2. Turbulence meters 3. Turbographs 4. Anemographs 5. History of meteorology.**—*M.R.*

3.5–217 551.551:513.56

Kampé de Fériet, J., **Mathematical methods used in the statistical theory of turbulence; Harmonic analysis.** *Maryland University, Institute for Fluid Dynamics and Applied Mathematics, Lecture Ser.* No. 1, **1950–1951.** 108 p. 2 figs., 8 refs., 7 equations, 2 append. **DWB**—Details of a series of lectures on the statistical basis for turbulence theory, with special emphasis on harmonic analysis. The various chapters include the development of the integral solutions for: I. Monotonous nondecreasing functions; II. Riemann-Stieltjes integrals; III. Lebesque

integrals; IV. Fourier Stieltjes integrals and Fourier transformation of a function of class L; V. Fourier fundamental theorem; VI. Inversion formula; VII. Fourier transformation of a function of class L^2 in N-dimensional space and two appendices: nonlinearity of space S and example of Fourier transformation of an orthonormal set in a bounded domain. In Chap. VII, a new expansion is derived for the Fourier transformation of a function of N variables of class L^2 equal to zero out of a bounded set, in terms of a uniformly convergent series of orthonormal functions. *Subject Headings:* **1. Fourier analysis 2. Statistical theory of turbulence 3. Harmonic analysis. I. Zarantonello, E. II. Pai, S. I.**—*M.R.*

3.5–218 551.551

Matschinski, Matthias, **Sur la structure du vent et sur les phénomènes secondaires (differents "wind marks" sur le sable et sur la neige) qu'elle provoque.** [On wind structure and on the secondary phenomena (various wind marks on sand and snow) which it produces.] *Académie des Sciences, Paris, Comptes Rendus*, 233(10):580–582, Sept. 3, **1951.** equations. **DWB**—The equations of motion are applied to the case of the effect of wind moving over an obstacle and the production of wind traces or ripples in sand and snow. It is shown that the distance between crests corresponds to the distance between elements of turbulence, or in other words, is of the order of magnitude of the cells or vortices. *Subject Headings:* **1. Wind structure 2. Turbulence in clouds 3. Turbulence effects 4. Wind traces 5. Equations of motion.**—*M.R.*

3.5–219 551.551:551.508.53/4

Obukhov, A. M., **Kharakteristiki mikrostruktury vetra v prizemnom sloe atmosfery.** [Characteristics of the microstructure of winds in the layer of air near the ground.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geofiz.*, No. 3:49–68, **1951.** 18 figs., 17 refs., 33 equations. **DLC**—The design and the principles of a thermoanemometer for measuring the pulsations of wind velocity in the lowest 15 m of the atmosphere above the ground is described. The concept of structural function of velocity fields of turbulent flow is analyzed and a theoretical evaluation of the structural characteristics of wind fields in the lower layers of the atmosphere near the ground is presented. The effect of the inertia of the apparatus upon measurement of the structural function of a current is analyzed and the measurements are compared with theoretical conclusions from the theory of local isotropic turbulence. *Subject Headings:* **1. Wind structure 2. Micrometeorology 3. Wind microvariations 4. Thermoanemometers.**—*I.L.D.*

3.5–220 551.551:551.511

Timofeev, M. P., **O sutochnoĭ izmenchivosti turbulentnogo obmena.** [Diurnal variation of turbulent exchange.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 22(84):15–25, **1950.** 5 figs., 15 refs., 4 equations. **DLC**—The equations of BUDYKO and of LAĬKHTMAN for calculating the coefficient of turbulence are discussed critically. By means of LAĬKHTMAN's formula, the diurnal variations of the coefficient of turbulence are calculated at heights of 1 m during different types of weather and during all seasons. All meteorological data were collected near Leningrad. During clear summer weather the coefficient of turbulence may vary daily 100 to 1000 times. The diurnal variations of the turbulence coefficient during changing and overcast weather are the same in all seasons. The characteristics of the coefficient can be explained by variations in wind velocity at a height of 1 m and the temperature difference at two levels. *Subject Headings:* **1. Diurnal turbulent exchange variations 2. Turbulence coefficient 3. Leningrad, U.S.S.R.**—*I.L.D.*

3.5–221 551.551:533.17

Van Isacker, J., **Contribution à l'étude des fluides incompressibles en mouvement turbulent.** [Contribution to the study of incompressible fluids in turbulent movement.] *Belgium, Institut Royal Météorologique, Mémoires*, v. 43, **1951.** 44 p. 3 figs., tables, 13 refs., 110 equations. **MH-BH**—A discussion of the various theories of turbulence with an attempt at a synthesis. Chap. 1 sets out the general equations and defines concepts of mixing length, energy of turbulence and spectrum of turbulence. Chap. 2 deals with the flow of incompressible fluids in pipes and Chap. 3 introduces the problem of flow over rough surfaces. *Subject Heading:* **1. Turbulent flow.**—*C.E.P.B.*

3.5–222 551.553.1

Kleinschmidt, Ernst, sen., **Dreht der Wind zu Madrid im Tagesgang mit der Sonne?** [Does the wind at Madrid veer with the sun?] *Meteorologische Rundschau*, 4(11/12):214, Nov./Dec. **1951.** table. **DWB**—Gives a table of 3-hourly frequencies of wind direction (year) showing that wind does not veer regularly as stated by HELLMANN, but changes rapidly from NE to SW. It is an example of mountain and valley winds. *Subject Headings:* **1. Diurnal wind variations 2. Mountain and valley winds 3. Madrid, Spain.**—*C.E.P.B.*

3.5–223 551.555.1

Riehl, Herbert, Yeh, Tu-cheng, Malkus, Joanne Starr and La Seur, Noel E., **The north-east trade of the Pacific Ocean.** *Royal Meteorological Society, Quarterly Journal*, 77(334):598–626, Oct. **1951.** 24 figs., 4 tables, 32 refs., 17 equations. **MH-BH**—The structure of the trade NE of Hawaii is summarized in vertical sections based on 3 weather ships in July–Oct. 1945 It is found that the trade inversion layer rises downstream but trajectories of descending air pass right through it. Other vertical sections show temperature, potential temperature, humidity and lapse rates, and variability. The latter is greatest near 800 mb and is attributed largely to variations of inversion height. The heat flux from ocean to atmosphere and balance of latent and sensible heat are discussed quantitatively; export from the region is mainly as latent heat. Upward transport of energy is due to cumulus convection. *Subject Headings:* **1. Trade winds 2. Thermodynamics 3. Pacific Ocean.**—*C.E.P.B.*

3.5–224 551.557:551.513:551.558.29

Clapp, Philip F. and Winston, Jay S., **A case study of confluence as related to the jet stream.** *Journal of Meteorology*, 8(4):231–243, Aug. **1951.** 17 figs., table, 14 refs., equations. **MH-BH**—A continuation of the work reported by NAMIAS and CLAPP (1949) on the synoptic and physical factors leading to the development and maintenance of confluence in a given region. This paper attempts to define more exactly the conditions in the vicinity of a jet stream and is based on analysis of a series of 5-day mean charts for the 10,000 ft. level (May 1944). Geostrophic wind speed and temperature advection profiles show that local changes in wind speed result from advection of cold or warm air on either side of the jet stream, and that there is descending motion north and ascending motion south of the jet stream at 10,000 ft. *Subject Headings:* **1. Confluence 2. Jet stream 3. Vertical motion.**—*M.R.*

AQUEOUS VAPOR AND HYDROMETEORS

WATER VAPOR AND CLOUD PHYSICS

(*See also items:* 3.5–2, 3.5–31, 3.5–32, 3.5–35, 3.5–70, 3.5–96, 3.5–102, 3.5–120, 3.5–122, 3.5–180, 3.5–183, 3.5–215, 3.5–234, 3.5–237, 3.5–246, 3.5–247)

3.5–225 551.571:551.513.2

Wiszniewski, Wacław, **Strefowy rozkład pary wodnej w atmosferze ziemi.** [Zonal distribution of water vapor in the atmosphere of the earth.] *Gazeta Obserwatora PIHM*, Warsaw, 3(12):9–12, Dec. **1950.** 3 tables. **DLC**—The article is based on the contents of G. A. TUNNELL's communication published in *Meteorological Magazine*, London, 76(906), Dec. 1947, in which the author discusses the distribution of water vapor in the atmosphere on the basis of J. SZAVA-KOVATS' (Budapest) work. Tables showing (1) mean values of the contents of water vapor in the atmosphere, (2) the zonal distribution of water vapor above continental and sea surfaces and (3) circulation of water in the atmosphere are added. *Subject Headings:* **1. Water vapor distribution 2. Water vapor transport. I. Tunnell, G. A. II. Szava-Kovats, J.**—*A.M.P.*

3.5–226 551.571.4(261)

Durst, C. S. and Gordon, A. H., **The distribution of humidity at sea.** *Great Britain, Meteorological Office, Meteorological Research Committee, Meteorological Research Paper* No. 665. S.E. III/106, 30 July **1951.** 4 p. 2 figs., 2 tables. Mimeographed. **DWB**—At Ocean Weather Station JIG (53°50′N, 18°40′W), Oct.–Dec. 1947, vapor pressure differences sea

surface (assumed saturated at sea temperature) to 28–30 ft were compared with wind direction and force. Decrease greatest with N–E winds and force 2–3, least with S–SW winds. Relative humidities at bridge height from all data at JIG and ITEM were expressed as mode, 10 and 80 percentiles against wind direction and force, showing a minimum at force 2. *Subject Headings:* **1. Humidity lapse rate 2. Humidity variations 3. Ocean weather ships 4. North Atlantic Ocean.**—*C.E.P.B.*

3.5–227 551.573:551.551

Davies, D. R. and Walters, T. S., **The effect of finite width of area on the rate of evaporation into a turbulent atmosphere.** *Quarterly Journal of Mechanics and Applied Mathematics*, 4(4):466–480, Dec. **1951.** 2 figs., 7 refs., 37 equations. **DWB**—The paper analyzes the effect of width on the rate of evaporation from a plane, rectangular saturated area into a fully turbulent air stream. The calculated evaporation per unit area is proportional to (width) α, where α is less than unity, depending only on the turbulence. In adiabatic conditions $\alpha = 0.86$. This was confirmed by wind tunnel experiments. *Subject Headings:* **1. Evaporation theory 2. Turbulence.**—*C.E.P.B.*

3.5–228 551.573:551.463(265/6)

Hanzawa, Masao, **On the annual variation of evaporation from the sea-surface in the North Pacific Ocean.** *Oceanographical Magazine*, Tokyo, 2(2):77–82, June **1950.** 3 figs., table, 5 refs., equation. **MH-BH**—Evaporation in the North Pacific Ocean has been calculated from data of continuous observation at fixed points by means of the formulas of SVERDRUP and JACOBS. In the North Pacific the maximum of evaporation occurs in fall and winter and the minimum in early summer. The evaporation data are compared with those obtained by WÜST. No linear relationship could be established between evaporation and change in chlorinity; this is explained by the fact that chlorinity is controlled by the movement of water. *Subject Headings:* **1. Sea surface evaporation 2. Chlorinity 3. Oceanographic research 4. North Pacific Ocean. I. Wüst, G.**—*I.L.D.*

3.5–229 551.573:551.577.33(54)

Mahajan, L. D., **Evaporation of water and rainfall at Patiala.** *Science and Culture*, Calcutta, 17(4):172–174, Oct. **1951.** table, graphs. **DWB**—Evaporation from a shallow pan in a Stevenson screen was measured by weighing every 24 hours and the daily evaporation for unit exposed surface was calculated. Data on the monthly evaporation per unit area of exposed surface, the monthly frequency and amount of clouds of various types and monthly rainfall are given. The relationship between evaporation and rainfall is discussed. *Subject Headings:* **1. Evaporation measurement 2. Rainfall variations 3. India.**—*I.L.D.*

3.5–230 551.573:551.508.72(04)

Zakrent, Stefan, **Pomiar parowania ewaporometry Cz. I.** [Measurement of evaporation —evaporimeters. Part I.] *Gazeta Obserwatora PIHM*, Warsaw, 3(8):11–15, Aug. **1950.** 5 figs., table, 4 refs., 2 equations. **DLC**—A popular article giving some brief basic information on the theory of evaporation and detailed description and illustration of the design and operation of the Piche tube and the Wild scale evaporimeters, used by the Polish Meteorological Service. *Subject Headings:* **1. Evaporimeters 2. Evaporation theory 3. Popular meteorology.** —*A.M.P.*

3.5–231 551.574.1:551.524

aufm Kampe, H. J., Weickmann, H. K. and Kelly, J. J., **The influence of temperature on the shape of ice crystals growing at water saturation.** *Journal of Meteorology*, 8(3):168–174, June **1951.** 17 figs., 11 refs. **DWB**—The effect of temperature upon the shape of ice crystals is studied experimentally in a room-size cold chamber. The room atmosphere is seeded with either dry ice, silver iodide, etc. at temperatures above −20°C; no seeding was done below this temperature. Down to a temperature of −4°C single plate crystals are formed, between −4° and −9°C short prisms and twin plates are formed. Various changes occur in shape of crystals at lower temperatures; at −20°C columnar crystals appear. Observations of halos in ice crystal clouds are described. *Subject Headings:* **1. Ice crystal formation 2. Air temperatures 3. Halos.**—*I.L.D.*

3.5–232 551.574.1:551.509.67

Kiriukhin, B. V., **Uprugost' vodianogo para nad zhidkoĭ i zamersheĭ kapliami rastvora.** [Water vapor pressure upon liquid and frozen droplets of solution.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, 24(86):48–59, **1951.** 3 figs., 2 tables, 12 refs., 36 equations. **DLC**—A theoretical analysis of the water vapor pressure on the surface of drops of solutions of NaCl at positive temperatures and at temperatures below 0°C and of the vapor pressure of the surface of ice crystals in solutions. It was found that when nuclei of condensation and ice particles are present in the atmosphere, then up to −22°C condensation nuclei of NaCl are more active and droplets of solution appear first; and at temperatures below −22°C ice crystals are more active and conditions for the sublimation of water vapor are more suitable than for condensation. *Subject Headings:* **1. Drop formation 2. Vapor pressure on droplets 3. Cloud physics 4. Ice crystal formation 5. Saline nuclei.**—*I.L.D.*

3.5–233 551.574.1

Krastanow, L., **Über eine Grundfrage bei den Kondensationsvorgängen in der Atmosphäre.** [A basic problem on condensation processes in the atmosphere.] *Bulgarska Akademiia na Naukitie, Sofia, Doklady*, 3(1):13–16, Jan./March **1950.** refs., equations. **DWB**—A theoretical development for determination of the rate of formation and energy released in formation of a drop of water on a condensation nucleus, based on formula of BECKER and DÖRING (1935) where it was assumed that nuclei were completely wettable. The author maintains that with different saturation or supersaturation values, different degrees of wettability exist for a given nucleus. *Subject Headings:* **1. Condensation nuclei 2. Supersaturation 3. Drop formation.**—*M.R.*

3.5–234 551.574.1:551.576.11

Shishkin, N. S., **O sliianii oblachnykh kapel'.** [Coalescence of cloud droplets.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86):27–38, **1951.** 3 figs., 7 tables, 8 refs., 28 equations. **DLC**—After a brief, theoretical discussion of the growth of raindrops by condensation, the author presents a theoretical analysis of the mechanism of coalescence. The discussion covers the collision of droplets in the field of gravity, growth of drops by coagulation in the field of gravity, and the coalescence of drops during sudden changes in the velocity of air flow and during periodic changes in the velocity of air flow. *Subject Headings:* **1. Drop accretion 2. Cloud physics 3. Coalescence.**—*I.L.D.*

3.5–235 551.574.7

Great Britain. Meteorological Office, **Ice accretion on aircraft.** *Great Britain, Meteorological Office, Reports*, No. 9, **1951.** 36 p. 17 figs., 7 tables, 11 refs. M.O. 535d. **DWB**—Opens with a brief account of physics of supercooled water, condensation and sublimation, adiabatic heating and cooling and kinetic heating. Various forms of ice accretion and factors affecting them are described. Efficiency of water catch is calculated from air flow round a cylinder, drop size and liquid water content. Icing properties of cloud types are summarized and a "severity of icing" scale (7 stages) given, with frequencies on Mt. Washington. Effects of icing airframe and engine are described and flight precautions summarized. World charts give contours of 0°C and −40°C isotherms in Jan., April, July, Oct. *Subject Heading:* **1. Icing of aircraft.**—*C.E.P.B.*

3.5–236 551.574.7

Melcher, Domenic, **Experimentelle Untersuchung von Vereisungserscheinungen.** [Experimental investigation of icing phenomena.] *Zeitschrift für angewandte Mathematik und Physik*, 2(6):421–443, **1951.** 25 figs., 12 refs. English summary p. 443. **MH-BH**—Icing was examined in a wind tunnel to find weight, true and apparent volume, and crystal form of ice deposit. Setup is fully described. Diagrams and photographs show amount and density with varying temperature (−5 to −17°C) and liquid water content of air, material and roughness of surface (no effect on amount; adhesiveness varied), wind speed (decrease with increasing speed), and collector efficiency of cylinders of different diameters. Microphotographs show crystal structure. Open air investigations on roof showed ice formation a few minutes after saturation with respect to ice, always in fog, but never with clear sky, even at night. Thermal

effect on iced surface small. A steady (not alternating) electric field gave the most branche deposit. *Subject Heading:* **1. Icing.**—*C.E.P.B.*

PRECIPITATION

(*See also items:* 3.5–47, 3.5–57, 3.5–73, 3.5–81, 3.5–107, 3.5–153, 3.5–172, 3.5–229, 3.5–247

3.5–237 551.577.11:551.574.1:551.576.1

Shishkin, N. S., **Osadki iz konvektivnykh oblakov.** [Precipitation from convectiv clouds.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86):39–47, **1951** 3 figs., 2 tables, 9 refs., 15 equations. **DLC**—A theoretical investigation of the growth of drop and a calculation of the intensity of precipitation from clouds in which the density of saturate vapor pressure and radius of the drops vary with height, approximately as under natura conditions. The author demonstrates a procedure for calculating the growth of drops b condensation in purely aqueous clouds and the number of raindrops and the intensity of rainfa and discusses the growth of particles in clouds containing water in the solid phase. *Subje Headings:* **1. Precipitation mechanism 2. Drop accretion 3. Convective clouds 4. Clou physics.**—*I.L.D.*

3.5–238 551.577.2:551.506.3:551.579.4(54

Ganguli, M. K., Rangarajan, R. and Panchang, G. M., **Accuracy of mean rainfall estimate . . . data of Damodar catchment.** *Irrigation and Power*, Simla, 8(2):278–284, April **1951** tables, diagrs., refs. **DWB**—The accuracy of mean monthly rainfall estimates for a larg area, as a function of number and distribution of available gages, is calculated and the con clusion reached that a total of 50 properly distributed gages instead of the present 26 would b necessary for the 7,200 square mile basin of the Damodar River in order to avoid error exceeding ±10%, when estimated by the simple averages method and ±8.3% by th stratified weighted averages method. Monthly mean precipitation data 1915–1948, thei standard deviations and coefficients of variation are presented and variances analyzed. *Sub ject Headings:* **1. Rainfall networks 2. Rainfall distribution 3. Statistical techniques 4 Damodar Basin, India.**—*G.T.*

3.5–239 551.577.22(78/9

Clawson, Marion, **Sequence in variation of annual precipitation in the Western Unite States.** *Western Snow Conference, Proceedings 1948*, p. 92–96, Feb. **1949.** fig. **DWB**— Precipitation records for 1901–40 for a number of stations in the Western U. S. have beer analyzed statistically to determine the degree of persistence of wet or dry periods. Th total departures from normal (cumulative) without regard to sign (+ or −) are divided b the cumulative departures with regard to algebraic sign. This gives an index or coefficien of variability, which ranges from 1 or 2 in the Southwest where rainfall is more random, to or 8 in the northern Rockies and Cascades where, according to the author, the tendency towar persistence of dry and wet periods is greater. Some marked deviations occur in each area, an more stations need analysis before conclusions can be drawn. *Subject Headings:* **1. Precipita tion variations 2. Persistence 3. Western United States.**—*M.R.*

3.5–240 551.577.32(71

Pincock, G. L., **An analysis of precipitation on the British Columbia coast.** *Canad Meteorological Division, Cir-*1974; *Local Forecast Study* No. 9, July 3, **1951.** 7+p. 2 diagrs 4 tables. **DWB**—A brief general survey is followed by monthly, seasonal, half-yearly an yearly precipitation values presented in charts and tables for each of 11 zones as well as fo the northern and southern parts and the whole of the coast. Average annual precipitation fo the entire coast is 81.16″ with highest monthly means in Nov./Dec. in the north and Dec./Jan in the south, lowest in July. Snowfall is considered separately. *Subject Headings:* **1. Precipita tion data 2. British Columbia.**—*G.T.*

3.5–241 551.577.36:551.583.15:551.506.3(78

Leopold, Luna B., **Rainfall frequency: an aspect of climatic variation.** *American Geo physical Union, Transactions*, 32(3):347–357, June **1951.** 6 figs., 5 tables, 8 refs. **DWB**—

Although the annual values of rainfall in southwestern United States show no significant trend during the past century, evidence shown here indicates that the frequency of light rains (<.50 inch per day) increased significantly from 1850 to 1930. Data for Santa Fe, Las Cruces Agricultural College, Albuquerque and Fort Union, New Mexico are analyzed statistically in many ways and results shown graphically and tabularly. Both summer and winter precipitation amounts show this trend, indicating a probable shifting of zones of convergence. *Subject Headings:* **1. Climatic trends 2. Rainfall frequencies 3. Precipitation variations 4. New Mexico.**—*M.R.*

3.5–242 551.577.37:551.501.81

Atlas, David and Banks, Harold C., **The interpretation of microwave reflections from rainfall.** *Journal of Meteorology*, 8(5):272–282, Oct. **1951.** 21 figs., 14 refs., 13 equations. **MH-BH**—Equations of echo intensity are set out in terms of reflectivity of rain, attenuation due to intervening rain and distance of storm. It is shown that the maximum echo intensity is nearer than maximum rainfall intensity except for wave lengths exceeding 7 cm and small intense storms. Rainstorm models, resembling typical thunderstorms, are set up and one- and two-dimensional plots of echo intensity for 10 cm and 3.2 cm radar discussed. In isolated storms the position of maximum intensity can be determined, but with a storm behind another the contours bear little resemblance to real structure. *Subject Headings:* **1. Rainfall structure 2. Radar storm detection.**—*C.E.P.B.*

3.5–243 551.577.53

Lacy, R. E., **Distribution of rainfall round a house.** *Meteorological Magazine*, London, 80(949):184–189, July **1951.** 3 figs., photo, 3 tables, 2 refs. **DWB**—Nine rain gages were placed round a house 18½ ft high at Watford, at distances up to 18 ft with an autographic gage 200 ft away and an anemometer. Less than normal amount was recorded within 8 ft to N and E and 3 ft to S and W, down to 25% close to E wall. *Subject Headings:* **1. Rainfall amount 2. Building influences 3. Precipitation interception.**—*C.E.P.B.*

3.5–244 551.578.1

Hitschfeld, Walter, **Free fall of drops through air.** *American Geophysical Union, Transactions*, 32(5):697–700, Oct. **1951.** 2 figs., 14 refs., 14 equations. **DWB**—Terminal velocity data of water drops are used for the quantitative description of their accelerated motion when falling freely from rest. The method, based on the principle of aerodynamic similarity, is valid for water drops of radius 1.6 mm or less. Using, as an example, the Schmidt relation for terminal velocity, general expressions are obtained from the time of fall and the distance fallen as functions of the velocity of fall attained. Numerical results calculated from drop radii of 0.625, 1.00 and 1.50 mm agree well with the measurements of Laws. *Subject Headings:* **1. Raindrop velocity 2. Terminal velocity.**—*Author's abstract.*

3.5–245 551.578.1

McDonald, James E., **Discussion of "The behavior of water drops at terminal velocity of air" by Duncan C. Blanchard.** *American Geophysical Union, Transactions*, 32(5):775–777, Oct. **1951.** 2 refs. Reply by Duncan C. Blanchard p. 776–777. **DWB**—In reference to an article by D. C. Blanchard, suggestions are made and questions asked in connection with the study of turbulence in natural clouds, the shape of drops and their behavior, etc. D. C. Blanchard's reply is an acknowledgment of the points raised by J. E. McDonald. The article discussed was published in *AGU Transactions*, 31(6):836–842, Dec. 1950 (*see item* No. 2.8–113 in Aug. 1951 *Meteorological Abstracts*). *Subject Headings:* **1. Raindrop sizes 2. Raindrop velocity 3. Terminal velocity 4. Turbulence in clouds. I. Blanchard, Duncan C.**—*T.T.*

HYDROMETEOROLOGY

(*See also items:* 3.5–82, 3.5–83, 3.5–98, 3.5–238)

3.5–246 551.579:551.573(47)

Kashin, K. I. and Pogosian, KH. P., **O vlagooborote v atmosfere.** [On moisture exchange in the atmosphere.] *Meteorologiia i Gidrologiia*, No. 1:5–13, Sept. **1950.** 3 tables, 6 refs.

DLC—The purpose of this study is to estimate the role of evaporation in the hydrologic cy over small and large surfaces of the continent. The work by TSINZERLING on this probl published in 1949 contains inaccurate conclusions because of the incorrect method used in investigations. For correct determination of the amount of moisture transported by the masses from ocean to continent it is necessary to know: the amount of moisture in the atm sphere, precipitation, runoff and evaporation. The moisture content in the air should be tak in consideration up to 4–5 km elevation. The authors analyzed the observations for t U.S.S.R. and presented the following conclusions: 1) the important factor in moistening of t atmosphere is the evaporation from large surfaces, the evaporation from small areas is n effective; 2) the forest belts increase the roughness of the soil surface and therefore give so increased amount of precipitation and 3) the coefficient of moisture exchange for Europe U.S.S.R. presented by TSINZERLING as 2.5 is exaggerated approximately 7 times. *Subj Headings:* **1. Hydrologic cycle 2. Evaporation 3. Water transport 4. U.S.S.R.**—*N.T.Z.*

3.5–247 551.579:551.577.3:551.573(4

Keller, R., **Niederschlag, Abfluss und Verdunstung im schweizer Hochgebirge.** [P cipitation, runoff and evaporation in the Swiss Alps.] *Erdkunde*, 4(1/2):54–67, **1950.** tab refs. **DLC**—A major part of this article is dedicated to OTTO LÜTSCHG-LOETSCHER's resea in 15 areas of Switzerland reported in his partly published 3-volume work "Zum Wass haushalt des Schweizer Hochgebirges." [Hydrometeorology of the high mountain chain Switzerland.] Characteristic hydrometeorological phenomena prevailing in high mounta are discussed in conjunction with data obtained from a few selected typical areas. *Subj Headings:* **1. Hydrologic cycle 2. Hydrometeorology 3. Swiss Alps. I. Lütschg-Loetsch Otto.**—*G.T.*

3.5–248 551.579:551.311.49:634.

Prawdzic-Layman, Krzysztof, **U podstaw racjonalnej gospodarki wodnej.** [The ba of a rational water economy.] *Gazeta Obserwatora PIHM*, Warsaw, 3(10):1–3, Oct. 19 4 figs. **DLC**—Some measures of rationalizing and improving the water economy and preve ing the lowering of ground water levels and the increasing aridity of Polish soil (caused unplanned deforestation, defective regulation of river flows, etc.) are proposed and discuss *Subject Headings:* **1. Water conservation 2. Water resources 3. Hydrology 4. For influences.**—*A.M.P.*

3.5–249 551.579:628

Skibniewski, Leonard, **Gospodarka woda w zwiazku z uprzemysłowieniem kraju.** [Wa economy in connection with the industrialization of the country.] *Gazeta Obserwatora PIH* Warsaw, 3(8):10–11, Aug. **1950. DLC**—General considerations of the importance of plan water economy in already, and still to be, industrialized regions of Poland in peace and w *Subject Headings:* **1. Water resources 2. Water conservation 3. Poland.**—*A.M.P.*

3.5–250 551.579(

Skibniewski, Leonard, **Hydrologia i zarys historyczny jej rozwoju.** [Hydrology and historical outline of its development.] *Gazeta Obserwatora PIHM*, Warsaw, 4(3):1–3, Ma **1951. DLC**—The author points out the difference between hydrology as a science and draulic engineering, outlines the sphere of hydrology and presents a brief history of its velopment. *Subject Heading:* **1. History of hydrology.**—*A.M.P.*

3.5–251 551.579

Skliarov, V. M., **20-letie Moskovskogo gidrometeorologicheskogo tekhnikuma.** [2 anniversary of the Moscow Hydrometeorological Technical School.] *Meteorologiia i Gi logiia*, No. 1:76–77, Sept. **1950. DLC**—A brief review of the development of this sch established in 1930. At present the number of students is 500 while more than 400 pers take correspondence courses. The library of the school has now more than 36,000 volu *Subject Headings:* **1. Teaching of hydrometeorology 2. U.S.S.R.**—*N.T.Z.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

(*See also items:* 3.5–46, 3.5–48, 3.5–49, 3.5–176)

3.5–252 551.58:06

Science at Seabrook. *Johns Hopkins Magazine*, 2(1):3–8, 28, Oct. **1951.** photos. **DLC**—A history of the Johns Hopkins University's Climatological Laboratory at the 19,000-acre Seabrook Farms in southern New Jersey. Various phases of the theoretical, experimental, applied and educational work carried on at the Institute by its director Dr. C. Warren Thornthwaite and his collaborators are described and several members shown in action in photographs. *Subject Headings:* **1. Climatological research 2. Applied climatology 3. Climatic laboratories 4. Thornthwaite, Charles Warren. 5. Johns Hopkins University. Laboratory of Climatology, Seabrook, N. J.**—*G.T.*

3.5–253 551.58:06

Thornthwaite, Charles Warren, Church, Phil E. and Mather, John R., **Report of the Committee on Climatology, 1950–1951.** *American Geophysical Union, Transactions*, 32(5):765–768, Oct. **1951. DWB**—Climatological research carried out and instruction offered in American colleges, universities and government agencies are summarized. The report is based on information supplied by 89 colleges and agencies in reply to 112 letters sent out with a view to preparing a survey of climatological research and instruction in the United States. *Subject Headings:* **1. Climatological research 2. American Geophysical Union. Committee on Climatology.**—*G.T.*

3.5–254 551.58:551.524:63

Voigts, Heinrich, **Vergleich der klimatisch-phänologischen Bedingungen des Zwischenfruchtbaues nach Winterroggen in Schleswig-Holstein und in Hessen.** [Comparison of the climato-phenological conditions of catch-crop fruit cultivation after winter rye in Schleswig-Holstein and Hesse.] *Meteorologische Rundschau*, 4(9–10):184, Sept.–Oct. **1951.** 4 refs. **MH-BH**—Author compares accumulated temperatures and radiation for period from end of rye harvest to fall of midday temperature to 9°C. Low levels in Schleswig correspond to medium heights in Hesse. *Subject Headings:* **1. Accumulated temperatures 2. Agricultural climatology 3. Schleswig-Holstein, Germany 4. Hesse, Germany.**—*C.E.P.B.*

3.5–255 551.58:551.311

Wundt, Walter, **Abtragung und Aufschüttung in den Alpen und dem Alpenvorland, während der Jetztzeit und der Eiszeit.** [Erosion and deposition in the Alps and Alpine foreland, now and during the Ice Age.] *Erdkunde*, 6(1):40–44, Feb. **1952.** 2 figs., 2 tables, 6 refs. **DLC**—Opens with a summary of erosion and deposition in the upper Danube region. The annual variation (maximum in summer) is related to solar declination, temperature and precipitation on Säntis. The course of events in the Ice Age leads to conclusions as to climate. It opened with mild snowy winters like 1950/51 but extension of glaciers caused anticyclonic conditions which in time led to retreat. *Subject Headings:* **1. Climatic effects 2. Erosion 3. Glacial periods.**—*C.E.P.B.*

3.5–256 551.582:016(931)

†Dacre, J. C., **Climatology and meteorology of the New Zealand area: a bibliography.** (In: Garnier, B. J. (ed.), **New Zealand weather and climate.** Christchurch, N. Z., Whitcomb and Tombs, **1950.** p. 141–147.) Reprinted with additions from the *New Zealand Geographer*, 3(2):129–136, Oct. **1947. DLC**—Sources of data and information on New Zealand weather and climate are listed in several categories: Publications (1) of Meteorological Office, Wellington, (2) of New Zealand Journal of Science and Technology, (3) of Transactions of New Zealand Institute, (4) of New Zealand Journal of Agriculture and (5) of Geological Bulletins, Official Gazettes, Year Books and Miscellaneous Publications. Although unannotated, 142 publications are listed, making a valuable reference source for climatologists, meteorologists and

geographers. *Subject Headings:* **1. Bibliographies 2. Climate of New Zealand 3. New Zealand.**—*M.R.*

3.5–257 551.582(049.3)(47)

Pokrovskaia, T. V., **Obsuzhdenie knigi A. A. Borisova "Klimatologiia" v Glavnoĭ Geofizicheskoĭ Observatorii im. A. I. Voeĭkova.** [Discussion of the book by A. A. Borisov: "Climatology" in the A. I. Voeĭkov Central Geophysical Observatory.] *Meteorologiia i Gidrologiia*, No. 4:51–52, Dec. **1950. DLC**—Although the first reviewers of the book, assigned by the Hydrometeorological Publishing Department, did not sound any critical alarm concerning the grave shortcomings of the book, it was severely criticized at a special session of the scientific Council for its ideological, scientific and stylistic blemishes and pronounced inadmissible for utilization in schools. (*See item* No. 2–156 in Feb. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Critical reviews 2. Climatology 3. U.S.S.R. I. Borisov, A. A.**—*A.M.P.*

3.5–258 551.582(63)

Sivall, T., **Något om vädar och klimat i Etiopien och Eritrea.** [Weather and climate of Ethiopia and Eritrea.] *Ymer*, Stockholm, 71(1):32–44, **1951.** photos, map, graphs. **DWB**—After a descriptive section on the area and climate in general, the author discusses the seasons, the effect of the intertropical front, the rainfall and temperature. Histograms of average monthly rainfall at Massaua, Damas, Ghinda, Asmara, Addis Ababa, Gore, Harrar, Gondar and Agordat are presented. Temperature data for some of these stations are also given in a table and graph. *Subject Headings:* **1. Climate of Ethiopia 2. Climatic data 3. Ethiopia 4. Eritrea.**—*M.R.*

CLIMATIC CHANGES

(*See also items:* 3.5–141, 3.5–202, 3.5–241)

2.5–259 551.583.3(410)

Manley, Gordon, **Variations in the mean temperature of Britain since glacial times.** *Geologische Rundschau*, Leipzig, 40(1):125–127, **1952.** 14 refs. **DLC**—By analogy with the fluctuating climate of western Europe since 1700, conclusions are drawn about temperatures and weather types in Late-Glacial and Postglacial periods. *Subject Headings:* **1. Climatic changes 2. Great Britain.**—*C.E.P.B.*

3.5–260 551.583.3

Murray, G. W., **The Egyptian climate: an historical outline.** *Geographical Journal*, 117(4):422–434, Dec. **1951.** fig., 2 photos, refs. **DWB**—After a description of the erosion and falling water table of the desert, author discusses climatic changes. Plio-pleistocene was rainy. In early Pleistocene eastern desert was still rainy while Libyan desert was being wind-eroded. A desert period lasted from ca. 20,000 to ?8000 B.C., followed by a Mesolithic rainy interlude 8000–4000 B.C. There has been no continuous rain in lower Nubia since 3500 B.C. but above 600 m level, rain persisted until 2500–2000 B.C. Mediterranean rain belt extended slightly south 500 B.C.–500 A.D. *Subject Headings:* **1. Climatic changes 2. Egypt.**—*C.E.P.B.*

3.5–261 551.583.3

Pratje, Otto, **Der Tiefseeboden und das Klima.** [Deep sea bottom and climate.] *Umschau*, Frankfurt a.M., 51(15):468–470, August **1951.** fig. **DLC**—It is pointed out that remains of different types of foraminifera which cover the bottom of the ocean in several layers, provide a means of investigating the climate of the past. Pictures of foraminifera are presented and the mean temperatures they characterize, listed. The best results in this branch of deep sea research are credited to members of the Swedish expedition "Albatross," who penetrated 19 meters below the bottom of the sea and found various kinds of foraminifera indicating several changes in climate. The time of such changes can be calculated from the deposit rate of 1 mm per 100 years. *Subject Headings:* **1. Ocean floors 2. Climatic changes.**—*G.T.*

3.5–262 551.583.3(26)

Schott, Wolfgang, **Zur Klimaschichtung der Tiefseesedimente im äquatorialen Atlantischen Ozean. (Vorläufiger Bericht von dem wissenschaftlichen Ergebnissen der Schwe-**

lischen Tiefsee-Expedition an Bord des M.S. "Albatross" 1947/48.] [On climatic stratification of deep sea sediments in the equatorial Atlantic. Preliminary report of the scientific results of the Swedish deep sea expedition on board the M.S. "Albatross" 1947/48.] *Geologische Rundschau*, Leipzig, 40(1):20–31, **1952.** 3 figs., table, refs. Ovey, C. D., **On the validity and use of planktonic foraminifera in the interpretation of past climatic changes from a study of deep-sea cores.** *Ibid.*, 31–33, refs. **DLC**—Schott describes 3 cores (32°N, 19½ W; 21½ N, 46½ W; 17 N, 24 W). The ratios of cold to warm types of foraminifera in the first two show post glacial optimum and 3 divisions of Würm; the third, 9 m long, also last interglacial and Riss I, II. Ovey briefly describes qualitative determination of temperature variations from changes of foraminifera and CO_2 content. *Subject Headings:* **1. Climatic changes 2. Glacial periods 3. Ocean floors. I. Ovey, C. D.**—*C.E.P.B.*

3.5–263 551.583.7:551.736

Gerth, H., **Das Klima des Permzeitalters.** [The climate of the Permian.] *Geologische Rundschau*, Leipzig, 40(1):84–89, **1952.** fig., table, 15 refs. **DLC**—In Lower Permian the glacial deposits on the continent of Gondwanaland indicate a cool climate over much of the Southern Hemisphere and extend into India. At the same time the warm coral and Fusulina fauna of the Tethys Sea extended to Spitsbergen. The glaciation probably spread out from local high mountain centers. Explanation may be in the land and sea distribution. *Subject Heading:* **1. Paleoclimatology.**—*C.E.P.B.*

3.5–264 551.583.7(43)

Schwarzbach, Martin, **Aus der Klimageschichte des Rheinlandes.** [From the climatic history of the Rhineland.] *Geologische Rundschau*, Leipzig, 40(1):128–136, **1952.** 2 figs., refs. **DLC**—A detailed climatic table of the northern Rhineland since early Paleozoic is constructed, with a temperature curve. Climate of the Tertiary is discussed in detail. *Subject Headings:* **1. Paleoclimatology 2. Germany.**—*C.E.P.B.*

3.5–265 551.583.7:595.7:551.78(4)

Theobald, Nicolas, **Les climats de l'Europe occidentale au cours des temps tertiaires d'après l'étude des insectes fossiles.** [The Tertiary climates of western Europe from the study of fossil insects.] *Geologische Rundschau*, Leipzig, 40(1):89–92, **1952.** German summary p. 89. **DLC**—The Eocene insects of western Europe point to a warm subtropical climate, with a mean temperature of 25°C in southern France. During succeeding periods climate changed to a warm Mediterranean type at beginning of Pliocene. *Subject Headings:* **1. Paleoclimatology 2. Insects 3. Europe.**—*C.E.P.B.*

BIOCLIMATOLOGY

(*See also items:* 3.5–11, 3.5–43, 3.5–53, 3.5–199, 3.5–201, 3.5–202, 3.5–266)

3.5–266 551.586:631:551.588.6

Molga, Marian, **O zagadnieniach meteorologii rolniczej.** [The problems of agricultural meteorology.] *Gazeta Obserwatora PIHM*, Warsaw, 3(12):1–4, Dec. **1950. DLC**—The influence of meteorological conditions upon crop yields, agricultural planning and the altering of climatic conditions by means of shelter belts are the most important problems discussed. *Subject Headings:* **1. Agricultural meteorology 2. Shelter belts 3. Micrometeorology 4. Poland.**—*A.M.P.*

3.5–267 551.586:631(94)

Prescott, J. A., **The response of the growth of pastures to temperature.** *Australian Journal of Science*, 11(1):24–25, Aug. **1948.** fig., table, 2 refs. **DLC**—As a test of Van't Hoff's law of change in speed of growth with rise in temperature, data and regression curve are presented for growth of pasture versus mean temperature, given adequate moisture supply. All correlation coefficients significant at 1% level or better. Data used are for Woods Point, South Australia (rye, grass and clover), and South Johnstone, North Queensland (tropical grasses). *Subject Headings:* **1. Agricultural meteorology 2. Thermal efficiency 3. Forage crops 4. Van't Hoff's law 5. Australia.**—*M.R.*

3.5–268 551.586:632.18

Molga, Marian, **Pozary lesne a meteorologia.** [Forest fires and meteorology.] *Gazeta Obserwatora PIHM*, Warsaw, 4(2):7–11, Feb. 1951. tables. **DLC**—After pointing out the immense damage caused by forest fires throughout the world (Canada, United States, Australia, India, Germany and the U.S.S.R.) and the obvious dependence of the possibility of their outbreak and spreading on meteorological conditions prevailing in summer, the author presents information on preventive methods of combating forest fires used in some countries and discusses the theoretical considerations on which they are based (in particular the Nesterov method of defining the danger of forest fire outbreaks). *Subject Headings:* **1. Fire weather forecasting 2. Fire danger rating 3. Forest fires.**—*A.M.P.*

3.5–269 551.586:632.7

Waloff, Z. and Rainey, R. C., **Field studies on factors affecting the displacements of Desert Locust swarms in eastern Africa.** *London, British Museum, Anti-locust Research Centre, Anti-locust Bulletin*, 9:1–50, 1951. 9 figs., 9 tables, 36 refs. **GB-MO**—During sunshine flight took place at temperatures 6–8°C lower than in overcast or at night. Relations of flight to rain and humidity are discussed. Effect of wind speed and structure on flying and orientation is examined in detail. At all winds over 6 ft/sec the most frequent angle between flight and wind direction is 50–70°. The mechanism of this cross-wind flight is discussed without definite result. *Subject Headings:* **1. Bioclimatology 2. Insect migrations 3. Locusts.**—*C.E.P.B.*

3.5–270 551.586:636

Badreldin, A. L., Oloufa, Mohamed M. and Ghany, M. Abdel, **Heat tolerance of cows and buffaloes in Egypt.** *Nature*, London, 167(4256):856, May 26, 1951. **DLC**—A study of body temperature, respiration rate and pulse rate of 107 females, comprising buffaloes and Egyptian Shorthorn and Jersey cows. The average body temperatures, respiration rates and pulse rates were always higher for Shorthorn cows than for Jersey and native cows and were lowest for buffaloes. Increase in air temperature caused a rise in body temperature and in respiration rate and a fall in pulse rate. Increase in relative humidity caused a rise in body temperature and pulse rate but did not affect respiration rate except in the Shorthorns, whose respiration rate increased. *Subject Heading:* **1. Animal climatology.**—*I.L.D.*

3.5–271 551.586:636

Dobinson, J., **Heat tolerance in European breeds of cattle exposed to high environmental temperatures.** *Nature*, London, 168(4281):882, Nov. 17, 1951. **MH-BH**—Describes observations of rectal temperatures and respiration rates in Singapore. *Subject Heading:* **1. Animal climatology.**—*C.E.P.B.*

3.5–272 551.586:551.515:551.521.6/7

Bortels, H., **Beziehungen zwischen Witterungsablauf, physikalisch-chemischen Reaktionen, biologischem Geschehen und Sonnenaktivität. Unter besonderer Berücksichtigung eigener mikrobiologischer Versuchsergebnisse.** [Relations between weather sequence, physical-chemical reactions, biological processes and solar activity. With special reference to my own microbiological experimental results.] *Naturwissenschaften*, 38(8):165–176, April 1951. 15 figs., 59 refs. **DWB**—Meteoro-biological reactions are related to radiations which affect both men and microorganisms. In cyclonic weather these are relatively soft "T-radiations" (wave radiation from sunspots and short-wave radiations which in 1950 were negatively correlated with epidemics and magnetic disturbances); in anticyclones they are harder "H-radiations" (apparently particle radiation from the solar M-region). Large biochemical effects are attributed to these radiations; outbreaks and weakenings of infectious diseases and epidemics are related to phase displacements in the effect of H- and T-radiation on hosts and parasites. *Subject Headings:* **1. Bioclimatology 2. Atmospheric disturbances 3. Solar activity.**—*C.E.P.B.*

3.5–273 551.586:551.521.9

Bortels, H., **Wetter und Lebensvorgänge.** [Weather and life processes.] *Umschau*, 52(6):161–164, 15 March 1952. 7 figs., 14 refs. **DLC**—Man, animals and microorganisms all show relations to variations of weather such as cloudiness, barometric pressure or even magnetic activity. These are attributed ultimately to two types of "weather radiation," T and H (resembling Takata's radiation) which come mainly from sun, partly from moon by reflection, possibly partly from space, and also influence both geomagnetic and pressure variations. *Subject Headings:* **1. Bioclimatology 2. Radiation effects.**—*C.E.P.B.*

MISCELLANEOUS APPLICATIONS

VISIBILITY

(*See also items:* 3.5–118, 3.5–119, 3.5–156)

3.5–274 551.591:551.555.8(61)

Johnston, D. W., **Relation of visibility to wind in Cyrenaica.** *Meteorological Magazine*, London, 81(955):8–11, Jan. 1952. fig. **DWB**—Discusses reasons (stable air, little loose sand) why strong south winds in northern Cyrenaica on April 1–2, 1951, gave good visibility. *Subject Headings:* **1. Visibility 2. Cyrenaica.**—*C.E.P.B.*

3.5–275 551.591.1

Best, A. C., **Condensation nuclei and the development of radiation fog.** *Great Britain. Meteorological Office, Meteorological Research Committee, Meteorological Research Paper*, No. 698. S.E. III/118, 31 Jan. 1952. 16 p. fig., 5 tables, 7 refs., 39 equations. Mimeographed, **DWB**—The paper traces the effect of condensation on hygroscopic nuclei (sea salt) on visibility as humidity increases. Opacity (extinction coefficient) is discussed as a function of drop size and the latter as a function of mass of nucleus and relative humidity. With assumed distributions of nucleus size, opacity and liquid water are calculated for humidities, 80, 99.9 & 100%. Assuming all nuclei of same size, equations are solved for growth of droplets and decrease of visibility in cooling air after saturation; visibility is found to depend on water content, total salt content and size of nuclei. *Subject Headings:* **1. Fog formation 2. Visibility 3. Radiation fog 4. Saline nuclei.**—*C.E.P.B.*

3.5–276 551.591.1:535.3

Middleton, W. E. Knowles, **The attenuation of contrast by the atmosphere.** *Photogrammetric Engineering*, Dec. 1950. p. 663–672. 7 figs., 26 refs., 11 equations. Abstracted from reprint. **DWB**—This is a review paper dealing with the reduction in contrast or attenuation of the differences in luminance between various objects caused by the atmosphere. The author presents the derivation of Bouguer's law which holds for the transmissivity of monochromatic light and the equation of DUNTLEY for determining attenuation of contrast. He also discusses the dependence of the extinction coefficient upon wave length, observations on the aerosol to determine the size of haze and fog droplet, and the effect of the atmosphere on the color of objects. *Subject Headings:* **1. Atmospheric attenuation 2. Visibility 3. Bouguer's law.**—*I.L.D.*

3.5–277 551.591.3:551.591.6:551.508.92:629.13

Calvert, E. S., **Visual aids for low visibility conditions; a discussion of the fundamental requirements, with a brief account of some results obtained on the R.A.E. simulator.** *Royal Aeronautical Society, Journal*, 52(451):439–476, July 1948. diagrs., graphs, refs. **DLC**—Theoretical work done at the Royal Aircraft Establishment, Farnborough, England in 1946–1947 to determine what visual aids should be installed at civil airports. Among many diagrams and charts is one which gives intensity of lights or markers required for a visibility range of 1 mile under various atmospheric conditions (day and night). Meteorological visibility is expressed in miles and in international scale. Another chart shows comparative ranges of

runways in daylight (lighted and unlighted) with visibility from 50 to 10,000 yards. Perspective, slant visibility criteria, range at which various patterns or markings cease to be visible under various conditions, etc. are treated. *Subject Headings:* **1. Visibility 2. Slant visibility 3. Aircraft landing aids 4. Aerial navigation.**—*M.R.*

3.5–278 551.593:551.591.361

Sifontes, Ernesto, **Nubes y petroleo; por tierras y cielos de Anzoátegui.** [Clouds and oil; by land and air from Anzoategui.] Caracas, Imprenta Nacional, **1950.** 28 p. **DWB**—A general description of the structure of the atmosphere, cloud forms, and some aspects of atmospheric optics, followed by an account of unusual visibility of an oil conflagration which occurred on March 25, 1946 at Santa Rosa, Venezuela. The fire was plainly visible at El Tigre 30 miles away, and could be seen even at a distance of 100 km. Considerable quantitative data are given for atmospheric conditions and the conflagration. *Subject Headings:* **1. Optical phenomena 2. Exceptional visibility 3. Conflagrations 4. Venezuela.**—*M.R.*

THUNDERSTORM ELECTRICITY

(*See also items:* 3.5–4, 3.5–39)

3.5–279 551.594.22

Bossolasco, Mario, **Quelques résultats d'observation des décharges atmosphériques dans l'Italie du Nord.** [Some results of the observation of atmospheric discharges in Northern Italy.] *Geofisica Pura e Applicata*, 20:181–182, July–Dec. **1951.** 4 refs. In French, English summary p. 181. **MH-BH**—Using the Gane and Schonland ceraunometer (lightning recorder) at several places in northern Italy and tabulating the results which are indicative of the number of discharges in a radius of 20 km from the station, the author concludes that the number of cloud-ground discharges (0.25 per square km per year) is much smaller than has been estimated by other authors for less thundery regions and that such discharges usually occur with precipitation and are most frequent during hail storms. Cloud-ground discharges always occur in groups of two or more. Frequency is greater in northern Italy than on the Riviera and depends on other factors than co-latitude as NORINDER (1950) supposed. *Subject Headings:* **1. Lightning frequencies 2. Sferics 3. Ceraunometers 4. Northern Italy.**—*M.R.*

3.5–280 551.594.221:621.316.9

Harder, E. L. and Clayton, J. M., **Power line protection.** (In: **Thunderstorm electricity.** Chicago, University, Dept. of Meteorology, Oct. **1950.** p. 277–291. 14 tables.) **DWB**—The authors discuss and list in tables the most significant facts about lightning relevant to power system protection and line design. These include the concept of shielding (that is of providing a grounded wire or mast on which the lightning stroke may terminate), the fixed-stroke-current concept, the characteristics of the components of stroke currents, the number of strokes in lightning territory, the arrester currents and lightning on unprotected lines. The principal instruments used in field tests to study the current properties of lightning strokes are described briefly and the main field investigations, carried out by Westinghouse Electric Corporation, are listed. *Subject Headings:* **1. Lightning protection 2. Power systems.**—*I.L.D.*

3.5–281 551.594.221

Malan, D. J. and Schonland, B. F. J., **The distribution of electricity in thunderclouds.** *Royal Society of London, Proceedings, Ser. A*, 209:158–177, **1951.** 5 figs., 6 tables, 6 equations. 17 refs. **DWB**—Five methods of finding source heights of lightning discharges are described. At Johannesburg (1.8 km above M.S.L.) average height of first stroke to ground is 3.7 km above ground and successive discharges each tap levels rising by 0.7 km up to 9 km. It is inferred that negative charge is in a nearly vertical column up to 6 km long with base (1 km above cloud base) at 0°C, charge being generated by freezing or sublimation at top of column and lower negative pole carried down by large hydrometeors. The first leaders are highly branched and neutralize +space charges in or below cloud base, subsequent leaders are unbranched. *Subject Heading:* **1. Lightning.**—*C.E.P.B.*

3.5–282 551.594.221:621.316.9

Norinder, Harald, **Lightning protection for buildings.** (In: **Thunderstorm electricity.** Chicago, University, Dept. of Meteorology, Oct. **1950.** p. 293–299. 5 figs.) **DWB**—A brief review of the method used by the Institute for High Tension Research at Uppsala for studying the efficacy of lightning protective systems. Scale models of different types of farms (diagrams are given) and artificial lightning were employed. A procedure for studying the frontal variations of lightning strokes, which consists of measuring the current impulses striking lightning rods so as to determine the distribution of current along the conductors, is described. *Subject Headings:* **1. Lightning protection 2. Uppsala, Sweden.**—*I.L.D.*

3.5–283 551.594.223

Dolezalek, H., **Einige Kugelblitz-Beobachtungen.** [Some observations on ball lightning.] *Geofisica Pura e Applicata*, 20:183–185, July/Dec. **1951.** 2 refs. In German, German and English summaries p. 183. **MH-BH**—Five cases of unusual lightning phenomena are described in detail by the observers or the author who investigated the sites after the strokes. Four were single cases of ball lightning, one was a double stroke of ball lightning (3 cm and 10 cm diameter, respectively). Several were heard to explode, and in one case the burned area where the explosion occurred was observed. *Subject Headings:* **1. Ball lightning 2. Germany.** —*M.R.*

AURORAS

(*See also item:* 3.5–74)

3.5–284 551.594.51:551.510.535:537.56(0613)

Aden, A. L., **Auroral physics. International conference held in Canada.** *Physics Today*, New York, 4(12):33–37, Dec. **1951.** **DWB**—Report on the international conference on auroral physics and on properties and physics of the ionosphere and the mesosphere held at London, Ontario, on July 23–26, 1951. The conference was attended by over 120 representatives of 8 countries and was mainly concerned with investigations of the ejection of material from the sun, the transit of these particles to the earth and the resulting ionization phenomena. Abstracts of the papers submitted to the conference are presented. *Subject Headings:* **1. Auroral physics 2. Ionospheric physics 3. Ionization 4. Solar physics 5. Conference on Auroral Physics. I. U. S. Air Force Cambridge Research Center II. London, Ontario. University of Western Ontario.**—*G.T.*

3.5–285 551.594.51:535.33

Ol', A. I., **Linii vodoroda v spektre poliarnykh siianiĭ.** [Hydrogen lines in the spectrum of aurora borealis.] *Priroda*, Moscow, No. 9:46–47, Sept. **1951.** fig., 9 regs. **MH-BH**—Discussion of oxygen, nitrogen and hydrogen spectra which have been observed in various countries during auroral disturbances. Chart shows profile of spectrum of hydrogen lines (Hα) when the spectrograph is oriented toward the magnetic zenith and the magnetic horizon, respectively. Author claims that this proves that the sun emits corpuscles (protons) which reach the earth with a speed of 2500–3000 km/sec, or 1.5–2.0 times the usually accepted speed of solar corpuscles activated in the earth's magnetic field (1600 km/sec). It is recognized that particles may be abnormally accelerated during magnetic storms. *Subject Headings:* **1. Auroral spectra 2. Hydrogen lines 3. Magnetic storms.**—*M.R.*

3.5–286 551.594.52

Abbott, W. N., **The aurora of August 19, 1950, photographed in Greece.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):343–344, **1951.** 2 figs., 5 refs. **DWB**—The first photograph of an aurora registered in Greece is given. *Subject Headings:* **1. Auroras 2. Greece.** —*A.A.*

3.5–287 551.594.52

Gartlein, G. W. and Moore R. K., **Southern extent of aurora borealis in North America.** *Journal of Geophysical Research*, 56(1):85–96, March **1951.** 5 figs., map, 7 refs. **DWB**—Tabulation of auroral frequency for North America which has been done at Cornell University,

Ithaca, N. Y., since late in 1938 shows the relative frequency of overhead auroras at different geomagnetic latitudes and different times of the year. In the region between 58° and 60° (geomagnetic latitude), which lies between Montreal and James Bay, Canada, the seasonal effect is not marked, but in lower latitudes (New York to Montreal) the maximum occurs at the time of the equinoxes. A comparison during years of sunspot maximum or minimum shows some apparent correlation but this correlation does not stand up very well under statistical tests. Some auroras have been observed south of 52°(New York City) during every month of the year. *Subject Headings:* **1. Auroral frequencies 2. Auroral distribution 3. Sunspot cycles 4. North America. I. Cornell University.**—*M.R.*

3.5–288 551.594.51

Herman, Louis and Leinbach, Harold, **A photographic study of changes of the infrared emission of the polar aurora.** Alaska, University, Geophysical Institute, Experimental investigation of the upper atmosphere during periods of auroral activity, Contract AF 19(122)-431, Scientific Report No. 3, July 19, 1951. 4 p. photos. **DWB**—In changes of color in the rayed bands and draperies observed in auroral displays, the most striking change at high latitudes is the appearance of a red lower edge; this type B aurora is studied by pairs of pictures taken simultaneously of the aurora by two "Robot" cameras. Panchromatic film with a green filter and infrared film with a red filter are used. Measured relative intensity ratios of the infrared and green pictures and sequences of pictures are given and interpreted. *Subject Headings:* **1. Infrared auroral emissions 2. Auroral photography. I. Alaska. University. Geophysical Institute II. Contract AF 19(122)-431.**—*I.L.D.*

PART II. ANNOTATED BIBLIOGRAPHY ON OBJECTIVE FORECASTING

By: *Mollie P. Kramer*

EXPLANATORY NOTE

Starting with the premise that all forecast research is aimed at general forecast improvement, the *special* purpose of developing an objective forecasting method becomes the removal of the subjective element from one or more phases of a forecast procedure in such way as to enable any number of forecasters, regardless of experience, to start with given weather observations and arrive at the same forecast. Objective forecast methods may be placed in one of the following general categories:

1. Direct objective forecasting of the desired weather element from one or a combination of several chosen variables which may be either observed meteorological elements or measurements made from analyzed charts.
2. Objective forecasting of the pressure or contour pattern, including movement of depressions.
3. Objective forecasting of one or more weather elements from a prognosticated pressure pattern. This group would include semi-objective methods in which one or more variables (such as 700 mb flow) are prognosticated.
4. Development of objective steps in forecasting procedure such as objective weather map analysis or classification, objective analysis of thermal stability and others.

For the benefit of forecasters interested in the forecasting of some one specific weather element, a subject outline follows in which all articles have been grouped according to the element forecast and the variables employed to arrive at the desired forecast.

Selected studies on statistical forecasting (*see items* 3E–87 and 3E–112 below), numerical forecasting (*see items* 3E–23 and 3E–223 below), probability forecasting (*see items* 3E–21 and 3E–147 below), and analogs (*see items* 3E–70 and 3E–164 below) have been included to illustrate the variety of approaches possible to a meteorologist attempting to construct an objective system.

If objective *tests* of dynamic rules or methods such as those of SCHERHAG and PETTERSSEN have been run and their results recorded, such results have been included. A limited number of papers on forecast rules and precepts are included when such papers are considered highly valuable by forecasters for use as source material in developing objective methods (*see items* 3E–113 and 3E–218 below).

A number of unpublished reports which are in current use at the Washington National Airport or in the Weather Bureau Central Office as forecast tools have been abstracted. The initials WB-AS (Weather Bureau, Washington Airport Station) and WB-SRFD (Weather Bureau, Short Range Forecast Development Section) indicate the availability of these articles, which to our knowledge cannot be found in the well-known libraries.

The dagger (†) has been used before a reference to indicate a good bibliography source, the asterisk (*) a good source of data, and the symbol (§) a good source of synoptic material.

We wish to express our appreciation to Mr. Conrad P. Mook, Research Forecaster at the Washington National Airport Office of the Weather Bureau, for his cooperation and valuable advice in the preparation of this bibliography. Special thanks are due also to Mr. Roger A. Allen, Chief of the Short Range Forecast Development Section of the Weather Bureau, and to the men of that section for their assistance.

OUTLINE OF CONTENTS

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ANNOTATED BIBLIOGRAPHY ON OBJECTIVE FORECASTING

1885

3E–1 551.509.31

*Abercromby, Ralph, **Principles of forecasting by means of weather charts.** London, H.M. Stationery Office, **1885.** 123 p. 65 figs., tables, refs., appends. **DWB**—This probably represents the first attempt by a meteorologist to develop a comprehensive classification of weather types based on the prevailing air flow. The influence of certain singular pressure patterns over the northeast Atlantic upon the weather of Great Britain and the continent is dealt with. *Subject Headings:* **1. Objective forecasting 2. Synoptic analysis 3. North Atlantic 4. England.**

1895

3E–2 551.509.54

Russell, Thomas, **Meteorology, weather, and methods of forecasting.** New York, Macmillan, **1895.** 277 p. figs., tables, maps. **DLC**—In Chapt. VIII Russell developed one of the earliest "objective precipitation forecasting system which did not involve the prognosis of the pressure pattern." His forecasts, which were aimed at a large area rather than a single station, were based on the "current position of the LOW and its adjacent HIGH pressure areas." Complete instructions for forecasting large temperature changes are also given. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Statistical forecasting.**

1904

3E–3 551.582.2

Shaw, Sir William Napier, **On the treatment of climatological observations.** *Scottish Meteorological Society, Journal,* 3rd Ser., 13(20):3–13, **1904.** 6 figs., tables. **DLC**—Shaw classified climatological data according to weather types for use by forecasters. *Subject Headings:* **1. Objective forecasting 2. Objective weather map classification**

1905

3E–4 551 509.54

Besson, Louis, **Essai de prévision méthodique du temps.** [Attempts at methodical weather forecasting.] *Paris, Observatoire Municipal de Montsouris, Annales,* 6:473–495, **1905.** Trans.

available at Washington, D. C., Washington National Airport. 7 p. 7 figs. Photostated. **WB-AS**—Because he wanted to make the maximum use of local data and because he realized the advantage of expressing forecasts in terms of probability, BESSON developed a scatter diagram technique of expressing probability in terms of joint functions of two variables. His was most likely the oldest system which provided an objective method of drawing probability contours and of combining the probability contours of several charts. As variables he used wind direction and barometric pressure at a fixed time of day. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Montsouris, France.**

3E–5 551.509.31:551.577.2

Udden, Johan August, **On the cyclonic distribution of rainfall.** *Augustana College and Theological Seminary, Rock Island, Ill., Augustana Library Publication* No. 4, **1905.** 21 p. illus. **DLC**—Whereas UDDEN did not devise an objective method of his own, his work served to stimulate interest in the field. Using five years of 8 a.m. synoptic weather map data, he computed the percentage frequency of precipitation relative to total number of observations for each position of the center of low pressure. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Davenport, Iowa.**

1906

3E–6 551.509.5

Bartlett, J. L., **The study of practice forecasting.** *Monthly Weather Review,* 24(11):523–526, Nov. **1906.** table. **DLC**—The weather conditions over northwest North America during November 1905 are condensed and tabulated. From the table, 12 rules for November forecasting are formulated. With the data in the table the rules gave forecasts with a verification of 94% for precipitation and 85% for temperature. The author suggests that "loss in percentage of verification" when other data were used "should be partially compensated by the forecaster's familiarity with the existing weather movement." *Subject Headings:* **1. Objective forecasting 2. Rules of thumb 3. Madison, Wisconsin.**

3E–7 551.509.3:551.515.1

Bowie, Edward H., **The relation between storm movement and pressure distribution.** *Monthly Weather Review,* 34(2):61-64, **1906.** 2 figs., 7 tables. **DLC**—An objective technique for forecasting the 24 hours displacement of cyclones is described. It is assumed that any actual 24 hour storm track is the resultant of the effect of an eastward drift combined with the influence of the pressures acting toward the storm center. The application of the method is limited when insufficient data are available or when several ill-defined centers exist. *Subject Headings:* **1. Objective forecasting 2. Cyclone movement forecasting.**

1907

3E–8 551.509.33

Clayton, Henry Helm, **A proposed new method of weather forecasting by analysis of atmospheric conditions into waves of different lengths.** *Monthly Weather Review,* 35(4):161–167, April **1907.** 28 figs. (including synoptic charts), 4 refs. **DWB**—Variations of all meteorological elements at any place can be analyzed into series of waves which are similar in length at different stations but not in phase, drifting from west to east with speed inversely proportional to wave length. Charts show progressive movements of temperature waves across U. S., Feb. 23–March 4, 1899. (*Same abstract* as 2A-38 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Temperature waves 3. United States.**—*C.E.P.B.*

1912

3E–9 551.509.532:63

*Beals, Edward Alden, **Forecasting frost in the North Pacific States.** U. S. Govt. Print. Off., Washington, D. C., Bulletin No. 41-W.B. No. 473, Feb. 27, **1912.** 49 p. 3 figs., 6 charts, 3 diagrs., 5 tables. **DWB**—Although no strictly objective method of frost forecasting results from this study, it lays the groundwork for further research aimed at such a goal. The relationship between the evening dew point and the following minimum temperature is analyzed. Pressure distribution, radiation and wind direction and veer were also considered as variables. *Subject Headings:* **1. Objective forecasting 2. Agricultural meteorology 3. Frost forecasting 4. Northwestern United States.**

1917

3E–10 551.509.54

*Rolf, Bruno, **Probabilité et pronostics des pluies d'été.** [Probability and forecasting of summer rains.] Thesis (*Ph.D.*)—Uppsala, Sweden, **1917.** Unchecked. English trans. by W. W. Reed. 25 p. equations, append. (incl. 26 tables). **DWB**—This paper represents one of the first attempts to break away from purely synoptic forecasting and to express the probability of rain as a function

of selected meteorological elements. Barometric pressure, cloudiness, and wind direction were among the most important elements experimented with. A plea was made for further research along objective lines if only to develop methods which could serve as complements to synoptic forecasts. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Uppsala, Sweden. I. Reed, W. W.** (*trans.*).

3E–11 551.509.54

Schneider, Rudolf, **Kaltenbrunners statistische Methode der Wetterprognose.** [Kaltenbrunner's statistical weather forecasting method.] *Meteorologische Zeitschrift*, 34(6/7):239–246, **1917.** 2 tables. **DWB**—A brief description is given of KALTENBRUNNER's tables which are based on the principle that "like follows like." Practical tests in Vienna showed the statistical forecasts 14% superior for precipitation and 8% for cloudiness forecasts over the standard synoptic methods. Outside the city it was felt that a combination of both forecast types would best combine necessary adjustments for terrain with a certain desirable degree of objectivity. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting 3. Precipitation forecasting 4. Vienna, Austria.**

3E–12 551.509.53:63

Smith, John Warren, **Predicting minimum temperatures.** *Monthly Weather Review*, 45(8):402–407, Aug. **1917.** 11 tables, equations. **DLC**—Author discusses the prediction of minimum temperatures on radiation nights by the use of the linear equation $y=a+bR$ where R is the evening relative humidity and y is the variation of the night minimum temperature from the evening dew point. The equation when applied to hygrometric data obtained at special fruit stations in Ohio, showed very satisfactory results. In other localities, a curve was found to fit the data better than a straight line. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Agricultural meteorology 4. Ohio.**

1918

3E–13 551.509.53

*Nichols, Esek S., **Predicting minimum temperatures in Grand Valley, Colorado.** *Monthly Weather Review*, 46(5):213–228, May **1918.** 9 figs., table, 3 refs., equation. **DWB**—The former, highly subjective forecast method for the area is reviewed. As a basis for a new objective approach, the classification of nights according to months, state of sky, wind velocity and pressure distribution was undertaken. Increased accuracy in forecasting may be expected by the application of the SMITH hygrometric formula;

$$y=a+bR$$

where R is the evening relative humidity, y is the departure of the morning minimum temperature from the evening dew point, and a and b are constants. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Grand Valley, Colorado.**

1920

3E–14 551.509.53

Belden, W. S., **Predicting minimum temperatures.** *Monthly Weather Review, Suppl.* No. 16:32–34, **1920.** 7 figs., 2 tables, refs., equations. **DLC**—Missouri temperature forecasts reached by combining the results of two methods, 1) the median temperature hour method and 2) the hygrometric method (in which minimum temperature is plotted against earlier dew point and relative humidity), are found superior to forecasts made by either method alone. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Missouri.**

3E–15 551.509.532:63

Franklin, H. J., **Cape Cod cranberry frosts.** *Monthly Weather Review, Suppl.* No. 16:20–30, **1920.** fig., 13 tables, refs. **DWB**—Minimum temperatures were calculated by the linear equation $Y=a+bR$ in which R is the evening relative humidity and Y, the departure of the minimum temperature from the dew point. Data represented all still, clear nights "in which frost conditions existed and sufficiently complete records" were kept, 1913 to 1917 inclusive. Rules for adjusting forecasts for various values of wind velocity, barometric pressure, and cloudiness were drawn up. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Frost forecasting 4. Agricultural meteorology 5. Cape Cod, Massachusetts.**

3E–16 551.509.54:63

Hallenbeck, Cleve, **Forecasting precipitation in percentages of probability.** *Monthly Weather Review*, 48(11):645–647, Nov. **1920.** fig., table, ref. **DLC**—"During the irrigating and alfalfa-harvesting periods the Weather Bureau office at Roswell, New Mexico, issues an amplification of the forecast, in which the probability of rain within 36 hours is expressed in percentages," 100% being absolute certainty of rain. The basis of this method is a series of composite weather maps showing

the frequency of precipitation, in percentages, with different types of pressure distribution. These maps are used only for reference and in conjunction with the daily weather map. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Agricultural meteorology 4. Southwestern United States.**

3E–17 551.509.53:63

Nichols, Esek S., **Notes on damage to fruit by low temperatures: prediction of minimum temperatures.** *Monthly Weather Review, Suppl.* No. 16:37–45, **1920.** 6 figs., 6 tables, refs. **DWB**—A quick review is given of an earlier article, "Predicting minimum temperatures in Grand Valley, Colorado," (*see item* 3E–13 above). The author's maximum-minimum temperature formula is modified by removing the effect of dew point and adding a new term to account for the possible effect of unknown factors such as atmospheric pressure, cloudiness, and wind. It is suggested that the two formulas be used to supplement each other. *Subject Headings:* **1. Objective forecasting 2. Agricultural meteorology 3. Minimum temperature forecasting 4. Grand Valley, Colorado.**

3E–18 551.509.53

Smith, John Warren, **Predicting minimum temperatures from hygrometric data.** *Monthly Weather Review, Suppl.* No. 16:6–19, **1920.** 24 figs., tables, 14 equations. **DWB**—Hygrometric data for radiation nights are plotted on scattergrams to show the relationship between minimum temperature, evening dew point, and relative humidity. The straight line or curve of best fit is then calculated for various stations. It is concluded that "hygrometric data may be used profitably in predicting minimum temperatures during radiation nights in rural districts" and that the "equations and factors determined for one place can be used at any other place with a similar climate and topographic surroundings." *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting.**

3E–19 551.509.53

Young, Floyd D., **Forecasting minimum temperatures in Oregon and California.** *Monthly Weather Review, Suppl.* No. 16:53–58, **1920.** 5 figs., 2 tables, ref. **DWB**—Results from the use of the hygrometric formula were sufficiently accurate to warrant further study of the matter aimed at discovering means of objectively forecasting departures of minimum temperature from the "normal." In YOUNG's formula, probable minimum temperature is expressed as a function of evening temperature and absolute humidity. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Oregon 4. California.**

1921

3E–20 551.509.54

*Blair, Thomas Arthur, **Local forecast studies—summer rainfall.** *Monthly Weather Review,* 49(4):183–190, April, **1921.** 9 figs., 2 charts, 4 tables, 2 refs. **DLC**—The relation between pressure, barometric tendency, wind direction, cloudiness, and subsequent rainfall at Dubuque, Iowa, is illustrated on graphs based on summer rainfall observations, 1901–1920. It is suggested that a series of similar simple data classification studies made throughout the United States would be valuable. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Dubuque, Iowa.**

3E–21 551.509.51

Dunoyer, L. and Reboul, G., **Le problème de la prévision du temps.** [The problem of weather forecasting.] *Journal de Physique et le Radium,* (5):129–141, May, **1921.** fig., table, 4 refs. **DLC.** Abstract in: *Monthly Weather Review,* 49(4):352, June **1921. DLC**—Rules regarding the behavior of various weather elements were applied to a given situation near Nancy, France, to arrive at the odds in favor of a forecast. A numerical measure of the accuracy of the forecast (coefficient de certitude) could then be derived. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting 3. Nancy, France.**

1922

3E–22 551.509.53

Keyser, Elgie M., **Calculating temperature extremes in Spokane County, Wash.** *Monthly Weather Review,* 50(10):526–528, Oct. **1922.** 2 figs. **DLC**—Parabolic curves were fitted to hygrometric data from five observation stations in Spokane County, Washington and from selected orchard key stations. Without use of a formula, a man after having obtained the evening relative humidity and dew point, can calculate the approximate minimum temperature for the following morning from these curves. In time, it may be possible to apply the early morning or midforenoon humidity data to arrive at an earlier determination of the afternoon temperature maximum. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Spokane, Washington.**

3E–23 551.509.3

Richardson, Lewis Fry, **Weather prediction by numerical process.** Cambridge [England] University Press, **1922.** 236 p. figs., maps, tables, refs., equations. **DWB**—Account of an elaborate method for expressing all existing atmospheric processes in numbers, and of applying a numerical integrating process to give the state of the atmosphere at a later time. A highly simplified example is given early in the discussion, followed by a considerable elaboration of the method, and finally by a full-fledged example worked out on computing forms. Results were not good due supposedly to inaccurate wind data. The method is very slow. *Subject Headings:* **1. Objective forecasting 2. Numerical forecasting.**—*U. S. Weather Bureau abstract.*

1925

3E–24 551.509.317

Newnham, E. V., **Classification of synoptic charts for the North Atlantic for 1896–1910.** *Great Britain, Meteorological Office, Geophysical Memoirs,* 3(26):181–200, **1925.** fig., 4 tables, 3 refs. **DWB**—Daily synoptic charts for Atlantic north of 30°N, Greenland and western Europe are classified by location of anticyclones and depressions. Monthly frequencies of 10 types are given and briefly discussed. An index gives dates of 36 anticyclones typed. (*Same abstract* as No. 2A–51 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Objective weather map classification 3. Anticyclones 4. Extended forecasting.**—*C.E.P.B.*

1926

3E–25 551.509.53

Nichols, Esek S., **Notes on formulas for use in forecasting minimum temperature.** *Monthly Weather Review,* 54(12):499–501, Dec. **1926.** 2 figs., ref., equations. **DWB**—This procedure represents a modification of NICHOL's maximum-minimum temperature method (*see item* 3E–17 above) by considering the effect of moisture in retarding cooling. The author discusses the use of equations of hyperbola in forecasting from hygrometric data, suggests the use of a scatter diagram, and compares the parabola and hyperbola used. By observing the depression of the dew point below the maximum temperature, he predicts minimum temperatures for California. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Minimum temperature formulas 4. California.**

3E–26 551.509.54

Ray, C. L., **Forecasting precipitation from local data.** *Monthly Weather Review,* 54(9):373–374, Sept. **1926.** 2 figs., 3 tables, ref. **DWB**—A statistical arrangement of the probability of rain following different pressure heights, wind directions, pressure changes, and several combinations of these factors is made. The results do not show a sufficiently high average of probability to serve their intended purpose as an aid in forecasting, but are presented anyway in charts and tables to show what can be done by this method and to illustrate the relative importance of the several elements as they relate to forecasting at Lansing, Mich. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Lansing, Michigan.**

1928

3E–27 551.509.53

Ellison, Eckley S., **A critique on the construction and use of minimum temperature formulas.** *Monthly Weather Review,* 56(12):485–495, Dec. **1928.** 10 figs., 40 refs., 6 formulas, 3 equations. **DLC**—Minimum temperature formulas may be classified roughly into three mathematical groups. The third group, those based upon the hygrometric relationship, is shown to be outstandingly superior. Within this group, the YOUNG formula (in which the smooth mathematical line of best fit is adjusted to approach the position of an irregular line of best fit) maintains a flexibility in a degree not attained by the others. In cases when insufficient data are available at a station to develop a formula of the YOUNG type, the SMITH and NICHOLS types are recommended, as these formulas lend themselves readily to interpolation. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature formulas.**

1929

3E–28 551.509.59:551.515.4

Alvord, Clifford M. and Smith, Robert Hall, **The tephigram—its theory and practical use in weather forecasting.** *Monthly Weather Review,* 57(9):361–369, **1929.** figs. **DWB**—As an objective measure of energy in the upper air, the tephigram is a valuable tool in short range forecasting. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Tephigrams.**

1935

3E–29 551.509.3

Petterssen, Sverre, **Practical rules for prognosticating the movement and the development of pressure centers.** Washington, D. C., U. S. Weather Bureau, **1935.** 44 p. 11 figs., equations. **DWB**—An early presentation of PETTERSSEN's kinematic formulas for forecasting the movement of pressure centers, and deepening and filling. Attached is a short article on the practical application of the formulas by W. R. STEVENS. The information found in this paper can be more easily obtained in PETTERSSEN's later (1940) work on "Weather Analysis and Forecasting." *Subject Headings:* **1. Objective forecasting 2. Pressure forecasting 3. Kinematic analysis 4. Cyclone movement forecasting. I. U. S. Weather Bureau.**—*U. S. Weather Bureau abstract.*

3E–30 551.509.54

Tannehill, Ivan Ray, **A method of improving local precipitation forecasts.** Unchecked. Abstract in: *American Meteorological Society, Bulletin*, 16(2):37–38, Feb. **1935. DWB**—By using two or more pressure factors in pressure-precipitation diagrams, precipitation forecasts for the third and fourth forecast periods were made for Nashville, Tenn. These forecasts proved comparable in accuracy with synoptic forecasts made 24 hours later. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Nashville, Tennessee.**

1936

3E–31 551.509.59:551.575

Petterssen, Sverre, **On the causes and the forecasting of the California fog.** *Journal of the Aeronautical Sciences*, New York, 3(9):305–309, July **1936.** 3 figs., 3 tables, refs., 2 equations. **DLC**—PETTERSSEN stresses the convective nature of California fog. Remarkable correlations are found between the time when the fog breaks and the height of the base of the inversion. This relation and the relation between the diurnal amplitude of temperature and heights of the base of the inversion give valuable rules for the forecasting of fog for Southern California. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. San Diego, California.**—*From author's abstract.*

1937

3E–32 551.509.53

Boyden, C. J., **A method of predicting night minimum temperatures.** *Royal Meteorological Society, Quarterly Journal*. 63:383–392, **1937.** 5 figs., equations. Discussion p. 389–392. **DWB**—The formula $T_2 = \frac{1}{2}(T_1' + D)$ where T_2 is minimum dry-bulb temperature; T_1' is maximum wet-bulb temperature and D is dew point, is extended to forecast minimum temperatures at individual stations in England on nights where there is no appreciable change of air-mass between the times of maximum and minimum temperature. Allowance is made for wind speed, cloudiness and fog formation. Discussion is to the effect that the formula is too rigid for practical application. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. England.**

3E–33 551.509.59:551.576

George, Joseph Johnson and Bradley, W. M., **A semi-quantitative method of forecasting summer stratus in North American tropical maritime air.** *Monthly Weather Review*, 65(2):43–46, Feb. **1937.** 4 figs., table, 7 refs., equation. **DLC**—The study assumes a knowledge of the turbulence-produced inversion in T_m air. Objectively determined "critical wind velocity" as related to stratus formation and dissolution is used as an aid to stratus forecasts based on the isobaric pattern. *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting 3. Southeastern United States.**

3E–34 551.509.59:551.575:629.13

Krick, Irving P., **Forecasting the dissipation of fog and stratus clouds.** *Journal of the Aeronautical Sciences*, New York, 4(9):366–371, July **1937.** 4 figs., tables, 2 refs. **DLC**—The basic assumption of this paper is that convective turbulence provides the mechanism for the transport of surface heat to the cloud base. Critical temperature (t_c) can be computed from aerological data or estimated from direct observations by pilots. The time at which a cloud layer breaks is a function of the difference between t_c and x (surface temperature) and can be found from an adiabatic chart. Several examples of the use of this method in Southern California are included to illustrate the accuracy to be expected. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Fog forecasting 4. Southern California.**

1938

3E–35 551.509.53

†Dufour, L., **Sur la détermination du minimum nocturne.** [On the determination of the night minimum temperature.] *Annales de Gembloux*, Bruxelles, 44(12):415–430, **1938.** 3 tables, 12 refs., 8 equations. **DA**—A brief review is given of the relation between radiation and minimum night

temperature. Reference is made to BRUNT's and ÅNGSTRÖM's atmospheric radiation formulas. Necessary variations on the radiation formulas according to degree of cloudiness are discussed and a minimum temperature formula derived. It is admitted that the formula does not embrace all meteorological variables which influence minimum temperature, but tests prove forecasts made by the formula superior to those made by empirical methods. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting.**

3E–36 551.509.317:551.576

Poulter, R. M., **Cloud forecasting: the daily use of the tephigram.** *Royal Meteorological Society, Quarterly Journal*, 64(275):277–292, **1938.** 10 figs., ref. **DWB**—Readings of the dry and wet bulb thermometers at 50 mb intervals provide information which, when plotted on a tephigram or similar diagram, enable a forecaster to predict with useful accuracy the amount, height and thickness of clouds during the day. Temperature and dew point at 4 ft in the forecast area and the probable rise of temperature are required to give the height of potential condensation, while the relation between the condensation temperature and temperature of the environment is the criterion for cloud formation. Cloud thickness is judged by the relation between the saturation adiabatic through the condensation point and the actual temperatures above, while cloud amount is estimated by the relative humidity of the environment at the condensation level. The application of this technique to the various situations met in day-to-day forecasting is described and illustrated. *Subject Headings:* **1. Objective forecasting 2. Cloud forecasting 3. Tephigrams.**—*From author's abstract.*

3E–37 551.509.59:551.576.4

Rampey, Ernest M., **Forecasting the height of low clouds or dense fog with upslope winds at Wichita, Kansas.** Wichita, Kan., U. S. Weather Bureau, Dec. **1938.** 14 p. map, 2 diagrs., 3 tables, 5 refs. **DWB**—Some indication of the heights of stratus that will form at Wichita can be had from dew point depression at Tulsa, Oklahoma, when the wind direction is upslope from Tulsa toward Wichita. The probable stratus heights are calculated on the basis of the lifting condensation level of the air over Tulsa in relation to the topography to the northwest of Tulsa. Objective aids to forecasting are presented in the form of tables showing condensation levels for dewpoint depression and ceilings at Wichita by adiabatic expansion of air transported from Tulsa. A completely objective approach to the problem seems impossible because dew point depression is, under most conditions, constantly undergoing change. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Tulsa, Oklahoma. I. U. S. Weather Bureau.**

1939

3E–38 551.509.53:63

§Allen, Charles C., **Minimum temperature forecasting in the Central California citrus district.** *Monthly Weather Review*, 67(8):286–293, **1939.** 16 figs., 2 refs., equations. **DWB**—YOUNG's hygrometric formula (*see item* 3E–19 above) is adapted empirically to the Central California citrus district. Tests of the formula indicated forecasts correct to within 2°F over 90% of the time on the average. It is thought that more precise and timely upper air data combined with a quantitative investigation of the lower strata will improve the forecasts. *Subject Headings:* **1. Objective forecasting 2. Agricultural meteorology 3. Minimum temperature forecasting 4. Central California.**

3E–39 551.509.59:551.515.4

Arakawa, H., **Thunderstorm forecasting with the aid of charts representing the topography of condensation level.** *Meteorological Society of Japan, Journal*, 17(3):101–103, **1939.** In Japanese, English summary p. 10–11. 4 figs. **DLC**—From a set of maps representing the topography of condensation level in space and time for a selected summer period it can be tentatively inferred that thunderstorm conditions will occur if the condensation level of surface air is lower than about 600–700 m. No useful conclusions can be drawn from the maps on rainy days. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Japan.**

3E–40 551.509.59:551.575:629.13

George, Joseph Johnson, **The causes and forecasting of low ceilings and fogs at Jacksonville Airport.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1939.** 79 p. 47 figs., 7 tables, 10 refs., append. Mimeographed. **DWB**—One of the first classic studies by J. J. GEORGE on the forecasting of fog at airports, based on a statistical-climatological or synoptic-climatological study of air masses, trajectories, types of fog and ambient humidity and wind conditions connected with fog formation at Jacksonville. Topographic features are discussed and a comparison made between conditions at Atlanta and Jacksonville. Many typical weather charts are presented for pre-warm frontal, advection and radiation fogs during the various seasons. Based on hourly ob-

servations for 1934–1938. (*Same abstract* as 2.2–33 in Feb. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Airways forecasting 4. Jacksonville, Florida. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–41 551.509.59:551.575

§George, Joseph Johnson, **The causes and forecasting of low ceilings and fogs at New Orleans Airport.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1939.** 31 p. 21 figs., 2 tables, 4 refs., append. (including 10 figs.). **DWB**—In this paper an attempt is made to reduce the forecasting of air mass fog at New Orleans to a form amenable to systematic treatment. A graph is prepared on which dew point depression at sunset is plotted against time of formation in hours after midnight. Three curves entered on the chart represent certain wind directions and critical velocities associated with fog formation. In some cases, when the computed gradient wind is less than the lower critical velocity, forecast results can be improved by subjectively determining whether the velocity is likely to increase to the appropriate value during the evening. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. New Orleans, Louisiana. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–42 551.509.53

Jacobs, Woodrow C., **Applications of Brunt's radiation equation to minimum-temperature forecasting.** *Monthly Weather Review*, 67(12):439–443, **1939.** fig., 12 tables, 11 refs., 14 equations. **DWB**—Because of the difficulty of determining the proper soil constants, BRUNT's formula is less accurate than the empirical formulas already in use. Its use, however, "is highly justified as a supplement to present minimum temperature formulae and as a study device." *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. California.**

3E–43 551.509.53

MacDonald, G. G., **Prediction of minimum temperatures of Habbaniya, Iraq.** *Meteorological Magazine*, London, 74(884/885):234–235, **1939.** equations. **DWB**—A minimum temperature formula based on the 15 hr temperature and the dew point is derived by the method of least squares and tested with success. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Habbaniya, Iraq.**

1940

3E–44 551.509.54

Yosino, Itaru, **The estimation of the quantity of rainfall.** *Meteorological Society of Japan, Journal*, 18(1), Jan. **1940.** Trans. by J. K. McGuire. 8 p. refs., equations. **DWB**—A formula involving vertical motion associated with frontal topography is deduced and tested. The author says agreement between observed and computed amounts of precipitation is generally good. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Japan. I. McGuire, J. K.** (*trans.*).

1941

3E–45 551.509.59:551.575:629.13

George, Joseph Johnson, **On the technique of forecasting low ceilings and fogs.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., Jan. 31, **1941.** 13 p. 6 figs., 2 tables. Mimeographed. **DWB**—Notes on the general concepts of fog classification, occurrence and forecasting based on synoptic charts and nomograms (the latter for determining time of formation based on experience at a given place). Fog formation for 20 places in the eastern U. S. A. was studied and charts presented to show type of fog and season of occurrence. An analysis of the causes of forecast errors shows that 70% of such errors could be avoided by careful study of cause of error. (*Same abstract* as No. 2.5–37 in May 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Forecast verification 4. Eastern United States. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–46 551.509.317:551.575:629.13

§George, Joseph Johnson and Ellett, M. W., **A study of fog and low ceilings for Washington Airport.** Washington, D. C., U. S. Weather Bureau, **1941.** 22 p. 5 figs., 4 refs. **DWB**—Although the primary purpose of the study was to classify stratus and fog into types associated with pressure distribution and gradient and frontal alignment, the charts prepared to designate the various types are useful tools for objective forecasting. The number of storms and duration in hours of low ceilings connected with each type during five years were tabulated. On p. 14, a method for forecasting ceiling heights, based on the relation between surface wind and gradient wind, is briefly outlined. *Subject Headings:* **1. Objective forecasting 2. Synoptic analysis 3. Airways forecasting 4. Washington, D. C. I. U. S. Weather Bureau.**

1943

3E–47 551.509.54

Brown, Jean A., **Weather map types for use in daily forecasting of winter rainfall amounts at Los Angeles, California.** Washington, D. C., U. S. Weather Bureau, July 1943. 28 p. 5 figs. 4 refs. DWB—JEAN BROWN has presented the results of a semi-objective, rainfall forecasting study for Los Angeles, Calif. based on a map-typing system developed by T. R. REED (*Monthly Weather Review*, Dec. 1932.) For each of the three main types, a parameter based on the distance and location of the low pressure center was used as a forecast guide. No criteria were suggested for the fourth main type. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Objective weather map classification 4. Los Angeles, California. I. U. S. Weather Bureau.**

3E–48 551.509.58(265/6)

§Riehl, Herbert and Elford, C. Robert, **Ocean analysis from coastal reports.** *Chicago, University Institute of Meteorology, Misc. Report* No. 9, Mar. 1943. 18 p. 15 figs., 2 tables, 9 refs. DWB—A method is outlined for obtaining weather estimates and forecasts of a general nature over any ocean area of the middle and high latitudes for which aerological data from adjacent shores are available. The method of reconstructing the weather conditions over the ocean from shore data is illustrated by the analysis of two different weather situations over the northeast Pacific Ocean, using reports from the Pacific Coast, Alaska, and Honolulu only. Two independent analyses of each case were prepared to demonstrate that two forecasters using this method should arrive at the same conclusions. *Subject Headings:* **1. Objective forecasting 2. Marine meteorology 3. Pacific Ocean.**

3E–49 551.509.59:551.575:629.13

Stephens, Gilley T., **A study in forecasting of radiation fog and stratus at Omaha.** *Chicago University, Institute of Meteorology, Misc. Report* No. 11, Oct. 1943. 27 p. 16 figs., 12 refs. DLC—The paper points out "certain considerations that may prove helpful in the preparation of a forecast for ceiling and visibility when these are likely to be limited by the formation of radiation stratus or fog." Of the numerous graphs drawn to find what factors represented the most favorable conditions for the formation of ground fog or stratus, a few showing the best correlations are included. Dew point, upper air wind directions, and humidity were among the best variables tried. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Stratus cloud forecasting 4. Fog forecasting 5. Omaha, Nebraska.**

3E–50 551.509.317:551.509.52

Thompson, Jack Coats, **The use of upper air winds for evaluating the stability factor in surface wind forecasting.** Pomona, Calif., U. S. Weather Bureau, 1943. 7 p. 3 refs., 5 figs., 2 tables, 1 equation. DWB—A study to aid in forecasting the surface winds in the Wenatchee Valley of Washington for the benefit of fruit growers. Surface winds in the valley are related to a pressure index taken from nearby barometric readings, and a stability index computed from upper wind and temperature data. Graphs are provided for use in forecasting. *Subject Headings:* **1. Objective forecasting 2. Wind forecasting 3. Wenatchee Valley, Washington. I. U. S. Weather Bureau.**—*U. S. Weather Bureau abstract.*

1944

3E–51 551.509.58:551.591:629.13

Carney, Charles Borromeo, **Aids in forecasting minimum visibilities in smoke at La Guardia Field.** La Guardia Field, U. S. Weather Bureau Airport Station, April 8, 1944. DWB—Seasonal probability tables for predicting the minimum visibility to expect with given wind directions and velocities are prepared for use in objectively forecasting cases of reduced visibility due only to smoke. Data from which the tables were constructed included no cases of frontal passage during the night, precipitation, or fog and stratus. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. Smoke 5. La Guardia Field, New York. I. U. S. Weather Bureau.**

3E–52 551.509.317

Dorsey, Herbert G., Jr. and Brier, Glenn W., **An investigation of a trajectory method for forecasting flow patterns at the 10,000 foot level.** *U. S. Weather Bureau, Research Paper* No. 8, Jan. 1944. 12 p. 11 tables. DWB—Account of a statistical investigation of the use of ROSSBY's constant vorticity trajectory theory in preparing 10,000 ft prognostic charts. Such charts were prepared for a period of a little less than one month, and verified by various statistical devices. Results showed that the method is useful when properly applied. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting 3. Winds aloft forecasting.**—*U. S. Weather Bureau abstract.*

3E–53 551.509.53:63 551.509.317

Rathbone, H. A., **A progress report on the use of wind vectors in forecasting minimum temperatures in the Whittier-Orange County district, California. 1944.** unpaged. 3 figs. **DWB**—An effort is made to reduce fruit-frost forecasting rules to the simplest possible terms. All factors involved in the nocturnal wind problem were combined on scattergrams into two factors which have numerical values and can be applied directly to correct the hygrometric formula. Subjective adjustments of the forecast are necessary to counter the error introduced by the assumption of a static synoptic situation. *Subject Headings:* **1. Objective forecasting 2. Agricultural meteorology 3. Minimum temperature forecasting 4. Whittier, California 5. Orange County, California.**

3E–54 551.509.3

Schumann, Theodor Eberhardt Werner, **An enquiry into the possibilities and limits of statistical weather forecasting.** *Royal Meteorological Society, Quarterly Journal*, 70:181–195, July **1944.** 2 figs., 3 tables, ref., 7 equations. Discussion by C. E. P. Brooks, F. L. Westwater, A. W. Ireland, D. Brunt and L. C. W. Bonacina. Reply by Schumann. **DWB**—A regression equation yields a probable value of the weather element, P (eg., temperature, pressure), at station A which the forecaster wishes to predict. Its accuracy depends essentially on the multiple correlation coefficient, R, between P and $X_1 \ldots X_n$ when the latter are the values of a number of weather elements observed at the central stations $B_1 \ldots B_n$ a specified time before P is observed. The value of the maximum correlation coefficient, R_M, decreases with increasing time lag from unity to zero. R_M for certain stations may be predicted with a fair degree of accuracy. If R_M for a time lag of 24 hours is less than a certain minimum (say 0.92 or 0.95) at present still unknown, statistical forecasting for 24 hours has no practical significance, but it has if R_M is greater than the required minimum. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting. I. Brooks, C. E. P. B. II. Westwater, F. L. III. Ireland, A. W. IV. Brunt, David V. Bonacina, L. C. W.**

1945

3E–55 551.509.317:551.509.54

Brier, Glenn Wilson, **Predicting the occurrence of wintertime precipitation for Washington, D. C.** Washington, D. C., U. S. Weather Bureau, Dec. **1945.** 15 p. fig., 4 charts, 4 tables, equations. **DWB**—Brier shows that a few, easily measured meteorological variables may be combined graphically in such a manner as to arrive at a rather good forecast through objective means. He suggests that his research methodology might be used by others in approaching specific forecast problems. Parameters chosen are the 10,000 ft isobaric pattern, previous precipitation distribution, and wind directions at the surface and at 10,000 ft. A set of forecasting rules is drawn up. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C. I. U. S. Weather Bureau.**

3E–56 551.509.317:551.509.53

*Burgtorf, Aubrey E., **An objective method of forecasting minimum temperatures for New York City.** Thesis (*M.S.*)—New York University, April **1945.** 28 p. 3 figs., 5 tables, 8 refs., equations. **DWB**—It is concluded that objective forecasts can be made for New York which will compare favorably with the official forecasts. The four objective methods previously devised for New York (*see items* 3E–58 and 3E–59 below) are briefly outlined and commented upon. Their results are compared in tabular form with a lower standard, "normal persistence forecasts" and an upper standard, U. S. Weather Bureau forecasts. "Method D" which represents a combination of the other objective methods showed excellent accuracy. All objective methods considered were based on a prognostication of the trajectory of the surface air expected at New York in 24 hours and the departure from normal of the 0830 E temperature at New York. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. New York, New York.**

3E–57 551.509.317:551.515.4

Chesebrough, Paul M., **Forecasting areas of nocturnal thunderstorms.** *Journal of Aeronautical Meteorology*, 2(1):18–25, Oct. **1945.** 9 figs. **DLC**—Whenever the pressure gradient at the 10,000 ft level indicates a flow of air from low pressure to higher pressure across the tropical flow as indicated at the 5,000 ft level, nocturnal activity should be expected. Such intersecting isobars or contour lines will always enclose an area. The rule is subject to qualifications. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. United States.**

3E–58 551.509.53

Mantis, Homer and Dickey, Woodrow Wilson, **Objective methods of forecasting the daily minimum and maximum temperatures.** *New York University, Dept. of Meteorology, Report* No. 4, April **1945.** Unchecked—A method is outlined for forecasting the 24-hour surface air trajectory

into New York, thus varying the index station from day to day. The modification in temperature of the selected air during an overland journey is taken as a linear function of its current departure from normal, its latitude, and the difference between its current temperature and the New York City temperature. Recourse is made to simpler empirical expedients in the case of an air trajectory over water. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. New York, N. Y.**

3E–59 5[illegible].509.53

Miller, James E. and Burgtorf, Aubrey, E., **Objective methods of forecasting the daily minimum temperature at New York City.** New York University, Dept. of Meteorology, Engineering Research Division, **1945.** 49 p. 2 figs., table, refs., 13 equations. **DWB**—Four of a number of simple, objective methods are selected as reasonably satisfactory on the basis of their average errors over a period of two years. With the use of the departure from normal of the 0830 E temperatures at New York and at certain fixed reference stations, reliable forecasts of the New York minimum can be made for the following night. It is found that a combination of various forecasting methods, each of which has a certain inherent forecasting power, gives better results than any one method considered alone. Objective results are compared with "normal persistence" and Weather Bureau forecasts, and the causes of success and failure of objective methods are discussed. The importance of avoiding all prejudice and subjective skill in testing objective methods is stressed. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. New York, New York. I. New York University. Dept. of Meteorology. Engineering Research Division.**

3E–60 551.509.59:551.591:629.13

*Mook, Conrad Payne, **Visibility forecasting.** Washington, D. C., U. S. Weather Bureau, Jan. **1945.** 20 p. 2 figs., 3 tables, equations, biblio. p. 15–17, appends. **DWB**—Considering visibility as being closely associated with the degree of atmospheric pollution near the ground, a method was devised for forecasting low visibilities at the Newark, New Jersey Air Terminal. The method developed utilized the Newark evening dew point and surface wind direction to express the probability that the visibility would lower to one mile wind or less during a short fixed period early the following morning. Trial forecasts showing the skill of the method when used without modification were then made on data independent of those on which the study was based. *Subject Headings:* **1. Objective forecasting 2. Visibility forecasting 3. Airways forecasting 4. Atmospheric pollution 5. Newark, New Jersey. I. U. S. Weather Bureau.**—*From Author's abstract.*

3E–61 551.509.59:551.515.4

Mook, Conrad Payne, **Washington thunderstorm study. Exhibit "A."** Washington, D. C., U. S. Weather Bureau Airport Station, April **1945.** 2 p. figs., table. **WB-AS**—An objective forecast method is developed and tested showing excellent results except when a tropical cyclone was present off the Atlantic coast. This study (using dew point and pressure change as parameters) forms the groundwork for a later, more elaborate method developed by Mook (*see item* 3E–106 below) in which stability was introduced as a third variable. In the data tested no case of thunder was observed when the dew point was below 55°F. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Washington, D. C. I. U. S. Weather Bureau.**

3E–62 551.509.59:551.576:629.13

§Steffan, H. C. and Morgan, J. H., **Forecasting stratus ceilings at San Francisco Airport.** San Bruno, Calif., U. S. Weather Bureau Airport Station, **1945.** 45 p. charts, maps, tables, ref. Manuscript. **DWB**—A series of smoothed curves representing average hourly temperatures with winds from all directions (summers, 1940 44) is included. Selected synoptic maps illustrate the stratus or non-stratus conditions associated with varying mean pressure patterns and 2000 ft resultant winds. The importance of insolation for stratus dissolution is shown graphically. For preparation of estimates of time of occurrence of stratus ceilings, daily check sheets were kept on pressure distribution and the "Raob dew-point depression." *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting 3. Airways forecasting 4. San Francisco, California.**

3E–63 551.509.59:551.576

§Stocker, G. H., **Forecasting Bay region stratus.** *Journal of Aeronautical Meteorology*, 1(4): 129–139, July **1945.** 13 figs. **DWB**—A procedure for stratus forecasting in which a given case is compared with classified typical pressure distribution patterns, lapse rates, and temperature-dew point spread change rate curves, is outlined and tested with usable results. *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting 3. San Francisco, California.**

3E–64 551.509.59:551.576.1:629.13

Vernon, Edward M., **Forecasting the time of formation of stratus cloud ceiling at Oakland, California Airport.** *U. S. Weather Bureau, Research Paper* No. 23, April **1945.** 8 p. fig., 3 tables, 3 refs., 5 equations. **WB-AS**—Time of stratus ceiling formation is found to be a function of the pressure gradient and the height of the temperature inversion in relation to the heights of the condensation level. A forecast formula was developed and tested during June and July, 1942 at the Oakland, California Airport. Although results were not too satisfactory, it is felt that the formula is valuable and will prove more so when direct data for the heights of the inversion are available and that important variables need not be estimated from temperature data at selected stations. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Stratus cloud forecasting 4. Oakland, California.**

1946

3E–65 551.509.59:551.54

Ashburn, Edward V. and Coogan, Elizabeth J., **An objective method for forecasting the pressure at Washington, D. C.** Washington, D. C., U. S. Weather Bureau, July **1946.** 5 p. 8 figs. **DWB**—A favorable report is given of tests of an objective method of forecasting pressure for Washington, D. C. Nashville and Chicago sea level pressure and Nashville surface wind direction (and 6 hr pressure change) are chosen as parameters. A similar objective method is suggested for the entire country. *Subject Headings:* **1. Objective forecasting 2. Pressure forecasting 3. Washington, D. C. I. U. S. Weather Bureau.**

3E–66 551.509.317:551.509.33

Ashburn, Edward V., Coogan, Elizabeth J. and Weiss, Leonard Luis, **Objective methods of forecasting five-day temperature and precipitation anomalies.** Washington, D. C., U. S. Weather Bureau, Feb. **1946.** 9 p. 5 figs., tables. **DWB**—Five-day objective precipitation anomaly forecasts based on 10 km data in one case and surface data in another, and temperature anomaly forecasts based on departure from normal at a chosen control station proved more reliable than the standard Weather Bureau forecasts. Contingency tables comparing the results of the various methods are included. *Subject Headings:* **1. Objective forecasting 2. Anomalies. I. U. S. Weather Bureau.**

3E–67 551.509.317:551.509.54

*§Brier, Glenn Wilson, **A study of quantitative precipitation forecasting in the T.V.A. basin.** *U. S. Weather Bureau, Research Paper* No. 26, Nov. **1946.** 40 p. 39 figs., 13 tables, ref., equations. **DWB**—A description of an objective forecasting technique is given along with actual examples of forecasts made by use of it. Two hundred and seventy maps were classified according to the relationship between the 10,000 ft isobar through Knoxville and surface areas of precipitation upstream from the city. Other variables chosen included surface pressure distribution, dew point, and upper air winds. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Knoxville, Tennessee.**

3E–68 551.509.312

Gentry, Robert C., **Notes on interdiurnal pressure and temperature changes in the upper air.** *U. S. Weather Bureau, Research Paper* No. 12, May **1946.** 17 p. 4 figs., 6 refs., 7 equations. **DWB**—An attempt was made to find significant relationships which might help in objective forecasting. Some of these studies of empirical relationships were: 1) relation between pressure at different constant level, 2) relation of temperature changes at 13 km to advection, 3) potential temperature at 13 km with temperature changes or pressure changes at other levels, 4) compensation between stratosphere and troposphere, and 5) relationship between changes of pressure and temperature at 3 km. Conclusions are given in statistical terms—for instance: there proved to be a high negative correlation between changes in potential temperature at 13 km and changes in pressure at 10 km. (*Same abstract* as No. 2.11–41 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Differential kinematics 3. Interdiurnal pressure changes 4. Compensation 5. Pressure-temperature correlations.**—*M.R.*

3E–69 551.509.59:551.591:629.13

Goldman, Louis, **Forecasting Boston visibility, a progress report.** Boston, Mass., U. S. Weather Bureau, July 5, **1946.** 10 p. 9 figs., 8 tables, 17 equations. **DWB**—The report represents a review of progress made in developing an objective method of visibility forecasting for Boston Airport. Special attention is paid to smoke in the air, wind direction and velocity, and day of the week. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. Smoke 5. Boston, Massachusetts. I. U. S. Weather Bureau.**

3E–70 551.509.319

Graves, Leon Franklin, **A study of analogues with respect to storm tracks.** Thesis (*M.S.*)—Massachusetts Institute of Technology, **1946.** 44 p. 17 figs., 5 tables, 4 refs. Microfilm. **DWB**—A study to decrease the need for subjective interpretation in analog forecasting. Pressure correlations were studied for periods of various lengths to determine analog persistence. It was found that forecast sequences seldom remain highly correlated more than two or three days, but that certain sequences retain significant correlation up to eleven days. *Subject Headings:* **1. Objective forecasting 2. Analogs.**—*U. S. Weather Bureau abstract.*

3E–71 551.509.317:551.509.54

§Horning, Forrest E., **An objective approach to rainfall forecasting at Denver, Colorado.** Denver, Colorado, U. S. Weather Bureau Airport Station, **1946.** 6 p. charts, 3 maps, table, 6 refs., equations. Manuscript. **DWB**—Maps are classified according to pressure distribution which controls rain-producing upslope flow in the Denver area. It is probable that higher skill scores would result from the use of measurements of available moisture in the air masses involved as a parameter. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Denver, Colorado. I. U. S. Weather Bureau.**

3E–72 551.509.3:551.591:629.13

Hunter, Marvin N., **A preliminary report on an objective method of forecasting visibility at Washington National Airport.** Washington, D. C., U. S. Weather Bureau Airport Station. **1946.** 4 p. 4 charts, table. **WB-AS**—The study is an "attempt to develop a method of determining the most probable visibility at Washington National Airport, for a period of one to eight hours in the future, under any meteorological conditions." A visibility chart was constructed from Dec. 1943 and Dec., Jan., Feb. 1944–45 data using wind velocity, "direction of the isobar" (upwind extension direction of the 5000 ft isobar passing through Washington), and the 0430E visibility as coordinates. Where data were lacking the chart was completed by interpolation. Provision was made for modification of the forecast if "the projected movement of a cold or occluded front indicated that it would pass Washington during the forecast period." Tests on Jan. Feb. 1946 data showed the objective method to equal the official airway forecast and surpass the persistence and visibility unlimited methods in accuracy. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. Washington, D. C. I. U. S. Weather Bureau.**

3E–73 551.509.3

§Miller, James E., **Application of vertical velocities to objective weather forecasting.** New York University, College of Engineering, Dept. of Meteorology, July **1946.** 85 p. 22 figs., 8 tables, ref., equations, append. **DWB**—"The procedure of an experimental objective forecasting system, based on computed vertical velocities, is described together with the research leading to its development. The results of a test of the system are discussed at some length. It is concluded that the forecasts have characteristics quite similar to forecasts prepared by present methods" and that further research along obvious lines is necessary before adoption of the system. Appendix A is devoted to the theory of the isobaric technique. For the convenience of those making studies connected with vertical motion, a series of isanabatic charts, 700 mb, are included in Appendix B. *Subject Headings:* **1. Objective forecasting 2. Vertical velocities. I. New York University. College of Engineering, Dept. of Meteorology.**

3E–74 551.509.317:551.509.53

Miller, James E., **An objective method of forecasting the daily minimum temperature.** Washington, D. C., U. S. Weather Bureau, **1946.** 13 p. 3 figs., table, ref., equations. **DWB**—This study represents a slight modification and improvement of the trajectory method devised by Mantis and Dickey (*see item* 3E–58 above). The method consists of two steps: 1) construction of a prognostic trajectory and 2) computation of the new temperature change along the trajectory. For simplicity, the construction of the surface air trajectory is based on the assumption that the surface air moves at 80% of the geostrophic wind speed, as computed from the sea level isobars, at an angle of 30° toward the low pressure side of the isobars. Measurements of present temperature at the station nearest the initial point of the trajectory and at the forecast station, departure from normal temperature, and difference in latitude between the two stations are used as independent variables in the equation for computing the temperature change. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. New York, New York. I. U. S. Weather Bureau.**

3E–75 551.509.59:551.576.4:629.13

Sanders, Robert A. and Hunter, James C., **Forecast procedure of cloud tops over water between Washington and Bermuda.** U. S. Weather Bureau, International Aviation Forecast Service, Research Report, April **1946.** 4 p. 6 figs. **DWB**—A year's supply of data, which consisted of all

available pilot reports, raobs from key coastal stations and mean monthly sea temperatures was collected. Clouds were classified as frontal and non-frontal and were plotted separately on scatter diagrams. The method of forecasting the non-frontal type consists of applying the temperature lapse rate to the mean curve of the month in question and extrapolating if necessary. Results show accuracy of within 1000 to 1500 ft. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. North Atlantic. I. U. S. Weather Bureau. International Aviation Forecast Service.**

3E–76 551.509.54

*§Thompson, Jack Coats. **Progress report on objective rainfall forecasting research program for the Los Angeles area.** *U. S. Weather Bureau, Research Paper* No. 25, July **1946.** 35 p. 4 figs., 9 tables, 9 refs., append. **DWB**—An improvement on BROWN'S (*see item* 3E–47 above) objective map-typing method was devised. Maps were typed according to the positive or negative values of the meridional and zonal indexes which were defined by the orientation of the isobars. Further parameters were selected for each type based on a consideration of the physical significance of the typing system and experience in use of such types of actual forecasting. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Los Angeles, California.**

1947

3E–77 551.509.317:551.509.54

*California. University. Dept. of Meteorology, **Second progress report on an objective rainfall forecasting research program for the Los Angeles area.** Los Angeles, July **1947.** 22 p. 10 figs., 33 charts, 15 tables, 9 refs., appends. Manuscript. **DWB**—An expansion of THOMPSON'S map-typing technique (*see item* 3E–76 above) to provide, by graphical and mathematical methods, estimates of the probability and amount of rainfall at Los Angeles. Six methods for forecasting occurrence and probability of occurrence are developed and applied to the four types. One method of forecasting amount together with the probability of its being correct is presented for each type. All but two are tested on independent data. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Los Angeles, California. I. Thompson, Jack Coats II. Rapp, R. Robert III. Smedley, David.**—*U. S. Weather Bureau abstract.*

3E–78 551.509.317:551.509.54

Carpenter, Archer B., **The use of 700-millibar data in precipitation forecasting in Utah.** Washington, D. C., U. S. Weather Bureau, **1947.** 8 p. tables, ref. **DWB**—It is claimed that the use of a precipitation index would improve the accuracy of precipitation forecast by giving "relative values to the meteorological elements usually considered by the forecaster" and by indicating the probability of a forecast's being correct. Among the variables used were mixing ratio, relative humidity, temperature lapse rate, and the lifting condensation level. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Salt Lake City, Utah. I. U. S. Weather Bureau.**

3E–79 551.509.3:551.575:629.13

George, Joseph Johnson, **A brief forecasting study for Charleston, South Carolina.** Atlanta, Ga., Eastern Air Line, Inc., Meteorological Dept., **1947.** 25 p. 15 figs., 3 tables. Mimeographed. **DWB**—An elaboration and refinement of a study on the same subject prepared by A. J. MEYER, JR. in 1943. Pre-warm frontal conditions, radiation and advection fog cases are catalogued by seasons; scatter diagrams, objective charts, etc. presented along with rules for improving airways forecasts at Charleston. Typical synoptic charts, tracks of depressions, etc. also included and discussed. (*Same abstract* as No. 2.1–44 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Fog forecasting 4. Charleston, South Carolina. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–80 551.509.317:551.509.54

*Harding, R. M. and Foster, W. D., **An objective quantitative method of forecasting winter precipitation amounts in eastern North Carolina.** Raleigh, North Carolina, State College of Agriculture and Engineering, Aug. **1947.** 12 p. map, graphs, tables, 4 refs., 14 appends. Manuscript. **DWB**—Five pairs of variables which proved the best "predictors" included comparisons of wind directions at various localities and altitudes, 24-hr changes in upper air wind directions at chosen stations, and minimum vs. maximum upper air mixing ratio values upwind from Raleigh. Evaluations of almost twenty other possible variables are included. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Raleigh, North Carolina.**

3E–81 551.509.53

*Harding, R. M. and Verlinden, F. J., **An objective method of forecasting the diurnal minimum temperature of Raleigh, N. C.** Raleigh, N. C., North Carolina State College of Agriculture and

Engineering, Institute of Statistics, Feb. **1947.** 20 p. diagr., 12 tables, equations. Manuscript. **DWB**—The trajectory method has been evaluated on two winters of data and tested on one, for situations where an entirely continental trajectory is forecast. A second method, using a linear regression on the Cincinnati temperature for the same type of situation, yielded almost equally accurate results. The persistence method (0130 of one day to 0730 of the next) proved the least successful. The variation in minimum temperatures at surrounding stations has been analyzed statistically. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Raleigh, North Carolina.**—*From author's summary.*

3E–82 551.509.59:551.575:629.13

*§Hilworth, J. T., **Low ceilings and visibilities at Birmingham, Alabama.** Atlanta, Ga. Eastern Air Lines, Inc., Meteorological Dept., **1947.** 21 p. 10 figs., 4 tables. Mimeographed. **DWB**—A typical J. J. GEORGE type of objective or local synoptic forecast study for Birmingham, not as comprehensive as those for Atlanta, Jacksonville (*see items* 3E–40 above and 3E–97 below), etc., but carefully prepared on the basis of 5 years (1940–45) of airways weather observation, and condensed so that it is easy to use as a forecast aid. The basic statistics, sample synoptic charts and scatter diagrams which show the dependability of the selected parameters as forecast criteria, are included. (*Same abstract* as No. 2.3–29 in March 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Airways forecasting 4. Birmingham, Alabama. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–83 551.509.54.551.578.4

MacDonald, Torrence H., **New York snow forecasting problem. Preliminary Report.** U. S. Weather Bureau Short Range Forecast Research Unit, **1947.** 18 p. 14 figs., 3 tables. **DWB**—The project was aimed at developing a technique for distinguishing between snow and non-snow cases and determining "to what extent current failures in forecasting the occurrence of snow cases are due to failure to forecast *precipitation* as compared to those due to failure to distinguish between snow and non-snow precipitation." Criteria chosen for distinguishing snow from non-snow cases were surface temperature and heights of ceiling and freezing level. *Subject Headings:* **1. Objective forecasting 2. Snow forecasting 3. New York, New York. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–84 551.509.59:551.591:629.13

Miller, James E. and Mantis, Homer T., **An objective method of forecasting visibility.** New York University, College of Engineering, Dept. of Meteorology, April **1947.** 43 p. 12 figs., 5 tables, refs., equations. **DWB**—An objective method of forecasting winter visibility at La Guardia Field is developed from winter data 1943–44 and tested in the winter of 1944–45. The method is based on 24-hr air trajectories which are forecast by a carefully prescribed, routine procedure. The visibility at the origin of a trajectory, the location of the origin, and the final wind velocity implied by the last segment of the trajectory, are combined by means of forecast charts and a formula, to produce a 24-hr forecast of the visibility. Tests of the method show that its accuracy is not much different from that of other visibility forecasts, but it is pointed out that an objective procedure has certain advantages over the normal subjective forecasting methods. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. New York, New York. I. New York. University. College of Engineering. Dept. of Meteorology.**—*From author's abstract.*

3E–85 551.509.59:551.591:629.13

Mook, Conrad Payne, **Visibility at Washington as related to the sea-level pressure pattern.** Washington, D. C., U. S. Weather Bureau, Dec. **1947.** 3 p. 3 figs., 2 tables, 2 refs. Manuscript. **DWB**—With the assumptions that "the primary factor in reducing early morning visibility at Washington is smoke" and that "smoke occurs at Washington as the HIGH center move slowly east of Washington," the problem became to objectively analyze and test these hypotheses. For four months of data, the 0730E visibilities were plotted against the positions of the dominant HIGH. "Cases in which the surface wind had an easterly component or when the HIGH was located to the east of line AB (approximately Buffalo-Pensacola) are listed as forecasting subsequent visibilities of 3 miles or less. All others are listed as forecasting visibilities greater than three miles." Certain subjective improvements for the objective forecasts were suggested. Skill scores from test data showed the objective method definitely superior to the persistence and slightly inferior to the conventional. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. Smog 5. Washington, D. C. I. U. S. Weather Bureau.**

3E–86 551.509.317:551.509.53

§Mook, Conrad Payne and Price, Saul, **Objective methods of forecasting winter minimum temperatures at Washington, D. C.** *U. S. Weather Bureau, Research Paper* No. 27, Aug. **1947.**

38 p. 14 figs., 4 charts, 4 tables, 3 refs., equations, appends. **DWB**—The New York University trajectory method is described and applied to Washington, D. C. in a slightly modified form. Forecast equations in which normal and current temperatures at Washington and the index station are variously weighted are developed for each class of air trajectories over land. A separate set of parameters, including mean sea surface temperature of the trajectory is devised for cases originating over the sea. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Washington, D. C.**

3E–87 551.509.3

*South Africa. Meteorological Research Bureau, **Statistical weather forecasting.** Pretoria, South Africa, 1947. 58 p. tables, refs., equations. Mimeographed. **DWB**—A rough, but comprehensive treatment of the method of short or long range forecasting by means of statistical methods —that is, by using maximum correlation coefficients. Methods of treating data, selecting parameters of places for correlation, smoothing, reduction of standard error, integrated autocorrelations, integration along a single space coordinate, orthogonal analysis, examples of use of method and estimation of success of application to forecasting for South Africa and the United States are presented. The last chapter takes up an application of statistical methods to forecasting rate and direction of travel of atmospheric disturbances across South Africa. (*Same abstract* as No. 3.1–54 in Jan. 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting 3. South Africa. I. Schumann, Theodor Eberhardt Werner.**—*M.R.*

3E–88 551.509.59:551.515.4

Verlinden, F. J. and Harding, R. M., **An objective method for forecasting summer thunderstorm activity in the vicinity of Raleigh, North Carolina.** Raleigh, North Carolina, State College of Agriculture and Engineering, 1947. 14 p. 13 charts, equations. **DWB**—Five variables showed discriminatory powers in the development of an objective technique for forecasting thunderstorms within the next 24 hours in May–Aug. These were: 1) surface air mass type, 2) 0130E dew point temperature, 3) 1500 m wind direction versus the 300 m wind direction, 4) 1500 m relative humidity versus the 1500–5000 m lapse rate and 5) the month. Skill scores showed improvement when the technique was tested only on days for which complete data were available. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Raleigh, North Carolina.**

3E–89 551.509.317:551.509.54

Vernon, Edward M., **An objective method of forecasting precipitation 24–28 hours in advance at San Francisco, California.** *Monthly Weather Review*, 75(11):211–219, Nov. 1947. 8 figs., 13 tables, 5 refs., equations. **DWB**—When synoptic data are expressed in numerical parameters which are then subjected to statistical tests, useful results may be obtained from a relatively small sample of data. The method developed in this fashion is highly objective. The results of its use are most accurate in January and February and least accurate on "Southerly" type maps in December and "Northwesterly" and "Southwesterly" type maps in March. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. San Francisco, California.**

1948

3E–90 551.509.51

*Argentina. Dirección General de Navegación e Hidrografía, **Predictor local del tiempo.** [Local weather predictor.] 3rd ed. Buenos Aires, Talleres Gráficos Continental Gurfinkel Hijos Soc. Resp. Ltd., 1948. 39 p. figs., tables. **DWB**—A series of forecast charts and tables were compiled from 26,000 observations at 18 stations on the Argentine coast. Chief elements dealt with were precipitation, wind and humidity. A list of practical forecast rules in included. (*Same item* as 3C–118 in March 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Argentina.**

3E–91 551.509.59:551.515.4

§Beebe, Robert G., **An objective method for forecasting thunderstorms in the Atlanta area.** Atlanta, Ga., U. S. Weather Bureau, June 1948. 13 p. 6 figs., 2 refs. Manuscript. **WB-SRFD**—A quasi-objective method is presented for predicting the occurrence of thunderstorms in the Atlanta area during the 12-hr period beginning at 1330 EST during July and August. Variables measuring moisture, stability and circulation patterns at the 850 and 700 mb levels are combined through the use of scatter diagrams to determine a tentative forecast. These "forecasts" were checked on two seasons of independent data and in actual use during three additional seasons. The independent data were later added to the dependent data and it was found that both the analysis of the scatter diagrams and accuracy of the forecasts showed no appreciable change. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Atlanta, Georgia. I. U. S. Weather Bureau.**—*Author's abstract.*

3E–92 551.509.317:551.509.52

Beers, Francis D., **A preliminary study of the problem of forecasting northerly winds in the Sacramento Valley during the fire weather season.** U. S. Weather Bureau, April **1948.** 5 p. 3 graphs. **DWB**—An attempt is made to develop an objective method of forecasting (12–24 hours in advance) the downslope northerly winds, the föhn effect of which often reduces the relative humidity to less than 8%. June–Sept. data for four years are plotted on scatter diagrams using surface pressure at selected stations as abscissa and ordinate. Probability curves are drawn. Occurrence of northerly winds is also related graphically to pressure and winds aloft. *Subject Headings:* **1. Objective forecasting 2. Wind forecasting 3. Fire weather forecasting 4. Central California. I. U. S. Weather Bureau.**

3E–93 551.509.3:016

†California Institute of Technology, **Evaluation of forecast aids. Part I. World-wide weather studies. Part II.** Contract AF W28-099 ac-430, Preliminary Progress Report, May 28, **1948.** 18 p. 2 figs., refs. Final Report, *ibid.*, Aug. 15, **1948.** 99 p. 40 figs., 10 tables, biblio. p. 63–99. **DWB**—The initial work involved the preparation of a card file and bibliography, usually from a preliminary literary survey, and the compilation of results of answers to a questionnaire received from 900 forecasters, to help in evaluation of forecast aids for 12-hour movements of highs, lows and wave crests. The aids tested for Sept.–Nov. 1947 were: 1) the steering method, 2) extrapolation method, 3) PETTERSSEN's method and 4) mean trajectory method. For steering, the 700 and 500 mb levels were found to be more indicative than the 850 mb or 300 mb levels. Results are given in detail and a list of 500 references divided into 5 categories is included. (*Same abstract* as No. 3.1–53 in Jan. 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Forecast aids 3. Short range forecasting 4. Bibliographies. I. Contract AF W28-099 ac-430.**—*M.R.*

3E–94 551.509.53

Cole, Claude A., **An objective method for forecasting minimum temperatures for Earl Station, California.** Los Angeles, Calif., U. S. Weather Bureau, [1948?] 4 p. diagrs., illus., tables, ref. **DWB**—The combining of selected pressure, temperature and dew point parameters by a graphical summation technique similar to that used by BRIER (*see item* 3E–67 above) proved a successful means for forecasting minimum temperature for a windy station. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Earl Station, California. I. U. S. Weather Bureau.**

3E–95 551.509.532

Franssila, Matti, **On the forecasting of frost with Ångström's formula.** *Geophysica*, Helsinki, 3:102–113, **1948.** fig., 3 tables, 3 refs., 6 equations. **DWB**—Using surface observations from Malmi airport (on the north coast of the Gulf of Finland, 60°15′N) and aerological data from Ilmala, the author applies ÅNGSTRÖM's formula ($t_m = C_1 d_1 - C_2 d_0 - K$) and comes to the conclusion that: (a) the use of aerological measurements does not appreciably improve the accuracy of frost forecasts, (b) the minimum temperature is practically independent of temperature variations in the air mass, (c) the value of k in the above formula depends mostly on cloudiness and wind speed and hence the problem is mainly to forecast those two elements for the next night and (d) if the air mass does not change, the use of psychrometer readings taken at 0800, 1400, 1700 or 2000 leads to no significant differences in accuracy of forecast of minimum temperature for the following morning. (*Same abstract* as No. 7 27 in July 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Minimum temperature forecasting. 4. Finland.**—*M.R.*

3E–96 551.509.59:551.575:629.13

*George, Joseph Johnson, **Further studies in air mass fog at Atlanta. Part I—Advection fog. Part II—Radiation fog.** Atlanta, Ga. Eastern Air Lines, Inc., Meteorological Dept., **1948.** Pt. I. 8 p. 4 figs., table, 2 refs. Mimeographed. Pt. II. 10 p. 2 figs., 4 tables, ref. Mimeographed. **DWB**—The growing realization of the importance of advection fog as well as radiation fog at Atlanta led to a re-analysis of data and a refinement of previous forecast methods (*see items* 3E–33 and 3E–45 above). Forecast procedures using dew point, temperature, and pibal gradient wind as variables are outlined and tested for both Atlantic and Gulf trajectories. In Pt. II an effort is made to improve earlier radiation fog forecasts where intensity or ceiling is concerned by more careful consideration of upper fronts and squall lines. (*Same item* as No. 2.3–28 in March 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Fog forecasting 4. Atlanta, Georgia. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–97 551.509.59:551.575

George, Joseph Johnson, **Jacksonville weather forecasting.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., Dec. 1, **1948.** 13 p. 8 figs., 5 tables, 2 refs. Mimeographed. **DWB**—

An extension and refinement of rules for forecasting fog and low ceiling at Jacksonville, first promulgated in J. J. GEORGE's paper (*see item* 3E–40 above), to cover specifically the numerous cases of advection fog. A catalog of cases occurring during the intervening years is included and charts for objective forecasting based on classification and analysis of these cases are presented. (*Same abstract* as No. 2.2–34 in Feb. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Jacksonville, Florida. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–98 551.509.3:551.515.1

George, Joseph Johnson, **Weather forecasting at New York associated with the formation of Atlantic secondaries.** [Atlanta, Ga.] Eastern Air Lines, Inc., Meteorological Dept., Oct. **1948.** 42 p. 15 figs., 5 tables, 6 refs. Mimeographed. **DWB**—A synoptic, statistical and case history study, based on 12 years of data (1936–1948) to develop some objective tools and rules of thumb for forecasting the formation; rate and direction of movement, and deepening attending rain, snow, ceilings and visibility; duration of low ceilings and formation of freezing rain. Position and axis of anticyclone, trough, cloud and rain areas; upper air conditions, etc. are all used as objective criteria to establish the basic prognostic chart from which secondary conditions can be determined from general pattern. (*Same abstract* as No. 2.1–46 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Cyclogenesis 3. Secondary depression 4. Rules of thumb 5. New York, N. Y. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–99 551.509.59:551.575:629.13

*Hilworth, J., **A short study of air mass fog at Moisant Airport, New Orleans, Louisiana.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1948.** 17 p. 7 figs., 3 tables. **DWB**—A study intended to supplement J. J. GEORGE's article (*see item* 3E–41 above) and to account for the move from New Orleans Airport to Moisant Airport. The study was empirical, taken from data for two winters. A number of charts and graphs are presented, along with recommended procedure for forecasting time of fog formation from data available before sunset. Principal data used are dew point or dew point depression and pibals. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Airways forecasting 4. New Orleans, Louisiana. I. Eastern Airlines, Inc. Meteorological Dept.**—*U. S. Weather Bureau abstract.*

3E–100 551.509.317:551.515.4

Jones, Donald Richard, **Stability analysis by objective techniques.** Thesis (*M.S.*)—U. S. Naval Postgraduate School, Dept. of Meteorology, Annapolis, Md., **1948.** 33 p. 4 figs., 3 tables, 8 refs., 14 equations, append. **WB-SRFD**—By applying an objective system of analysis to a large number of raobs, JONES arrives at a value for his stability criterion (a function depending on vertical distribution of temperature, moisture, and pressure). Thunderstorm or no-thunderstorm forecasts made by comparing the stability index for each case (selected from dependent data) with the objectively determined criterion showed sufficiently high skill scores to make further tests on independent data desirable. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting.**

3E–101 551.509.317:551.509.53

*Kussman, Abraham S., **A statistical method of forecasting maximum temperatures for New York City.** Thesis (*M.S.*)—New York University, College of Engineering, April **1948.** 43 p. 2 tables, 9 refs. Manuscript. **DWB**—The main purpose of the investigation was "to produce a method of forecasting maximum temperatures from the 850 mb chart by determining statistically over a period of $4\frac{1}{2}$ years what effect the seasons and the surface weather and wind variable had upon" the difference between the daytime maximum and the 1600Z 850 mb temperature. The chief drawback of the method lies in the present lack of an objective method of forecasting the 850 mb temperature. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. New York, New York.**

3E–102 551.509.317:551.509.33:551.509.53

Leight, Walter Gilbert, **Verification of objective five-day temperature forecasts.** *U. S. Weather Bureau, Research Report,* Oct. **1948.** 16 p. fig., maps, 4 tables, 4 refs. **DWB**—Comparison of a very limited sample of subjective and objective forecasts showed the subjective to be considerably more accurate. The weaknesses of objective methods in five-day forecasting are discussed and recommendation made for further research to improve them. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting.**

3E–103 551.509.33

Leight, Walter Gilbert and Sartor, James Doyne, **Verification of objective monthly temperature forecasts.** *U. S. Weather Bureau, Research Report,* Aug. **1948.** 5 p. figs., table, 3 refs. **DWB**—

Tests run to determine the usefulness of the objective method for monthly forecasting showed the objective slightly inferior to the subjective approach and neither much better than chance. Research aimed at improving the upper air pattern is urged in lieu of an ambitious program of objective predictions. *Subject Headings:* **1. Objective forecasting 2. Forecast verification 3. Long range forecasting.**

3E–104 551.509.54

*§McGurrin, Martin, **Objective forecasting of rain for a twelve-hour period seventy-two to eighty-four hours in advance at San Francisco.** San Bruno, Calif., U. S. Weather Bureau, Forecast Center. Dec. **1948.** 64 p. 2 figs., diagrs., 2 tables, 5 refs., equations. **DWB**—"This study presents an objective forecasting method using many coordinates and many graphs. The coordinates (pressure gradient and temperature) were taken in pairs and plotted against rainfall; then they are regrouped, with many of the same coordinates employed on more than one graph." Skill scores varied between .38 and .13. Separate graphs for each season and the use of additional weather elements as coordinates are among the recommendations for forecast improvement. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. San Francisco, California. I. U. S. Weather Bureau.**

3E–105 551.509.59:551.591:629.13

*§Mook, Conrad Payne, **On the forecasting of early morning winter visibility at Washington National Airport.** Washington, D. C., U. S. Weather Bureau, Airport Station, Jan. **1948.** 11 p. 9 figs., 4 tables, 5 equations. Manuscript. **DWB**—"The problem selected was that of developing improved methods of forecasting the visibility at 7:30 a.m. in winter from meteorological data collected 6 to 12 hours previously." From an objective forecast of air mass trajectory an estimate of the probability of the occurrence of visibility of 1 mile or less can be made. Visibility at 0330E was incorporated as an additional factor to improve the probability chart. The chart was then tested on independent data, a probability of 50% or more being considered a forecast of 1 mile or less visibility. Skill scores for the objective forecasts were equal to, or slightly below, those for the conventional forecast. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Visibility forecasting 4. Washington, D. C. I. U. S. Weather Bureau.**

3E–106 551.509.59:551.515.4

Mook, Conrad, Payne, **An objective method of forecasting thunderstorms for Washington, D. C. in May.** Washington, D. C., U. S. Weather Bureau, **1948.** 3 p. 9 figs., 2 tables, 3 refs. Manuscript. **DWB**—Author attempted to integrate measures of moisture, stability and pressure change into a statement of the probability of the occurrence of thunder within the following 24 hours. Probabilities from three charts of the type described by Besson (*see item* 3E–4 above) using linear multiple regression were combined. The final probability statement was then restrained to lie between zero and unity by means of a graphical transformation. Tests on independent data show the objective forecasts about equal in reliability to the subjective except in those few cases when thunder occurs with a dew point of less than 55°F. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Washington, D. C. I. U. S. Weather Bureau.**

3E–107 551.509.59:551.515.1

§Palmer, Wayne St. Clair, **On forecasting the direction of movement of winter cyclones.** *Monthly Weather Review*, 76(9):181–201, Sept. **1948.** 37 figs., 2 tables, 9 refs., equations, append. **DWB**—A comprehensive study is conducted on the relation in the United States between prognostic pressure patterns and various forecasting parameters. Most satisfactory indicators were normal direction of movement, direction of movement during the past six hours, orientation of the major axis of the trough, and direction of the 3-hr isallobaric gradients. In the appendix certain other variables (e.g., steering and dominant sea level anticyclones) which showed no promise of improving the graphical forecasts based on the four surface variables, are discussed. *Subject Headings:* **1. Objective forecasting 2. Cyclone movement forecasting 3. United States.**

3E–108 551.509.59:551.575:629.13

§Penn, Samuel, **Forecasting ground fog at Hartford.** Boston, Mass., U. S. Weather Bureau, May **1948.** 25 p. 14 figs., 8 tables, ref. Manuscript. **WB-SRFD**—Variables (surface temperature, dew point, and surface and 500 m wind direction and speed) available about 1530E were related graphically to the probability of ground fog occurrence. This procedure was repeated with the same variables available at 2130E. For the 1530E data the "degree of accuracy in predicting the probability of ground fog occurrence from the charts was significant, but no skill was indicated toward forecasting the time of beginning of fog." 2130E data results were similar but the probability lines paralleled the lines of constant "spread" much more as would be expected from generally accepted theory. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Airways forecasting 4. Hartford, Connecticut. I. U. S. Weather Bureau.**

3E–109 551.509.317:551.509.54

§Penn, Samuel, **An objective method of forecasting precipitation amounts from winter coastal storms for Boston.** *Monthly Weather Review*, 76(8):149–161, Aug. **1948.** 27 figs., 5 tables, 9 refs. **DWB**—Parameters chosen were: 1) the 850 mb wind direction above the storm, 2) the 700 mb contour direction over the storm (must be forecast subjectively), 3) the latitude of the surface storm and 4) the minimum latitude of the 700 mb contour through Boston. Secondary variables selected were sea level pressure distribution patterns found on storm maps. Maps were classified into two groups according to precipitation occurrence. An example of an objective forecast showing the steps from the preliminary classification of the map to the final computation of precipitation value is included. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Boston, Massachusetts.**

3E–110 551.509.59:551.515.4 551.509.54

Price, Saul, **An objective method of forecasting the occurrence of summertime thunderstorms and precipitation at Washington, D. C.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, **1948.** 7 p. chart. Manuscript. **WB-SRFD**—Forecast is made from probability lines drawn on one chart on which are combined the sum of the 3-hour pressure tendencies at Washington and Pittsburgh with the wet bulb temperature at Washington. Suggestions for improvement of probability-line fit and choice of variables are included. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Thunderstorm forecasting 4. Washington, D. C. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–111 551.509.59:551.591:629.13

Roche, Robert D., **Spring, summer, and fall pre-warm frontal weather at La Guardia.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1948.** 26 p. 8 figs., 8 tables, 4 refs., 3 appends. Mimeographed. **DWB**—Data for the months of April through November 1940–1947 were used to determine the conditions which would justify a forecast of low ceiling in advance of warm fronts. (The last two years of record were reserved for an independent check or verification of the forecasts based on the first 6 years of data.) Many carefully worked out charts are included to aid the forecaster in establishing whether or not ceiling and visibility will go below minimum, time of closing and time of lifting of ceiling. (*Same abstract* as No. 2.3–31 in March 1951 *Meteorological Abstracts*.) *Subject Headings:* **1. Objective forecasting 2. Visibility Forecasting 3. Airways forecasting 4. La Guardia Field, New York. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–112 551.509.3

Rosini, Ezio, **Statistica e meteorologia.** [Statistics and meteorology.] *Rivista di Meteorologia Aeronautica*, 8(1):44–52, Jan.–Mar. **1948.** Review in: *Weather*, 4(3):80, Mar. **1949. MH-BH**—Meteorology is governed by statistical laws. Because dynamic meteorology cannot provide a satisfactory basis for forecasting, the forecaster falls back on analogs learned from experience. From statistical meteorology, methods of forecasting the probabilities of likely developments can be derived, and statistical laws can be found which add to meteorological knowledge. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting.**—*U. S. Weather Bureau abstract.*

3E–113 551.509.3

U. S. Weather Bureau, **Forecast rules and precepts.** Kansas City, Missouri, U. S. Weather Bureau Airport Station, May **1948.** 51 p. illus. **DWB**—A collection of over 300 empirical rules on forecasting, contributed by 15 meteorologists, and listed by element forecast. Some of the rules have only local application, while others are of more general character. No physical explanation is given for any of the rules, although many can be so explained. Some rules are well known, others more obscure. The collection is a valuable aid to research workers in objective forecasting. *Subject Headings:* **1. Objective forecasting 2. Rules of thumb. I. U. S. Weather Bureau.**—*U. S. Weather Bureau abstract.*

3E–114 551.509.3:551.515.1

Visscher, H. B., **The formation of extratropical cyclones in the Gulf of Mexico and the resultant spread of precipitation.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1948.** 30 p. 16 figs., 7 tables. Mimeographed. **DWB**—Recognizing that one of the main causes of bad forecasts for the eastern U. S. A. is the failure to properly anticipate cyclogenesis or wave formations along a cold front, the Eastern Air Lines meteorologists undertook two studies: one of the secondaries which form along the Atlantic Coast (*see item* No. 2.1–46 in Jan. 1951 *Meteorological Abstracts*) and this study of waves which form in the Gulf of Mexico and bring bad weather to the Mississippi Valley or southern states. Analysis of 850 mb charts for 2 years is accompanied by typical synoptic charts and rules for forecasting formation of these frontal waves, and specific aids for forecasting associated weather patterns in the southeast. (*Same abstract* as No. 2.1–48 in Jan. 1951 *Meteorological Ab-*

stracts.) *Subject Headings:* **1. Objective forecasting 2. Cyclogenesis 3. Southeastern United States. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–115 551.509.3:551.509.33

*Wadsworth, George P., **Short range and extended forecasting by statistical methods.** *U. S. Air Weather Service, Technical Report* No. 105–38, Feb. **1948.** 202 p. 3 figs., 21 graphs, 32 tables, equations. **WB-SRFD**—A critical examination is given of the "technique of prediction which utilizes a statistical examination of past series of element data for stations scattered over large areas. This technique considered the possibility of the prediction of future points in the time series, where a past record was available, and utilized the idea of auto- and cross-correlation as a means of detecting the fundamental dynamic properties which existed between and within the weather data." Parameters were sought which would adequately classify the static picture of the weather situation over a large area. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting.**—*From author's abstract.*

3E–116 551.509.312

Ylinen, J., **On the practicability of extrapolation formulas based on pressure observations in the computation of the movements of pressure centers and fronts.** *Geophysica*, Helsinki, 3:198–206, **1948.** 3 figs., tables, 8 refs., 6 equations. **MH-BH**—The author discusses the formulas of Angervo, Petterssen and Byers for computing the movement of high and low pressure centers from the distribution of pressure and variation around the center. The accuracy of the formulas was tested by applying them to 52 cases. The divergences between values calculated by the formulas of Angervo and Petterssen and observed values are analyzed. Divergences are due to change of velocity during the forecasting period. Formulas in which changes of velocity are considered give poorer results than simple formulas. A comparison between the results obtained with Byers' formula and those obtained with the formulas of Angervo and Petterssen indicate that the former is slightly better for forecasting pressure centers but is inferior for forecasting fronts. (*Same abstract* as No. 11 38 in Nov. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Synoptic analysis 3. Mathematical forecasting.**—*I. L. D.*

1949

3E–117 551.509.3:016

†Allen, Roger A., **Bibliography of objective weather forecasting.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, Nov. **1949.** 8 p. **MH-BH**—An unannotated bibliography of approximately 90 items, prepared in the U. S. Weather Bureau, Short Range Forecast Development Section. *Subject Headings:* **1. Objective forecasting 2. Bibliographies. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–118 551.509.3 551.509.5

American Institute of Aerological Research, Pasadena, **I. Evaluation of forecast aids. II. World-wide weather studies.** Contract AF 28(099)-1, Final Report, Sept. 1, 1948 Oct. 31, **1949. DWB**—Various forecast aids were evaluated including steering method, Petterssen's method (*see item* 3E–29 above), extrapolation, mean trajectory method, and iso-height-isotherm relationship. Results of their application show poor correlation with observed events. The combined use of particular elements unique in each method yielded a forecasting method superior to any single aid. Synoptic vertical motion charts were prepared and studied as a forecast aid. A method for forecasting temperature changes and the forecasting technique based upon weather types, analogs and comprehensive charts is discussed. A summary is given of an analysis of replies to a forecaster questionnaire dealing with usefulness of certain forecasting aids. *Subject Headings:* **1. Objective forecasting 2. Forecast verification. I. Contract AF28(099)-1.**—*U. S. Weather Bureau abstract.*

3E–119 551.509.317:551.509.54

§Angell, J. K. and Chen, C. K., **Final report on an objective rainfall forecasting method for the Los Angeles area.** California, University, Dept. of Meteorology, Feb. **1949.** 26 p. 3 maps, diagr., 9 refs. Manuscript. **DWB**—After summarizing previous work done at Los Angeles on precipitation forecasting, this report describes attempts to develop a completely objective, quickly usable method of forecasting rainfall amount for 0 to 36 hours in advance at Los Angeles. An additional study aimed at forecasting the occurrence of rainfall during the period 24 to 48 hours in advance is described. Two simple sea level pressure indexes are selected which are remarkably successful for making these forecasts. Interesting comments are made about the need for objectivity, map-typing, and the number of variables which are necessary. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Los Angeles, California.**—*U. S. Weather Bureau abstract.*

3E–120 551.509.5:629.13

§Bailey, R. E., **An analysis of airline forecasting problems at Boston.** New York, Eastern Air Lines, Inc., Meteorological Dept. 1949. 17 p. 7 figs., tables, 4 refs. **DWB**—The difficulty of forecasting for Boston due to its coastal location and its proximity to the junction point of the Atlantic coast and St. Lawrence valley storm tracks is stressed. The method developed by ROCHE and FUNKE (1946) is considered satisfactory for forecasting Boston precipitation. Maps are included to show the relation between the synoptic situation over the northwest and the occurrence of precipitation and resultant sub-minimum ceiling and visibility at Boston. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Precipitation forecasting 4. Boston, Massachusetts. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–121 551.509.54

*§Blue Hill Meteorological Observatory, **Mt. Washington and Blue Hill data aids to snowstorm forecasting for Boston.** Contract Cwb-8099, Final Report, 1948–49, on Snowstorm Phase, Dec. 21, 1949. 48 p. 7 figs., tables, biblio. p. 47–48, 3 appends. **DWB**—Objective methods of forecasting precipitation and snowfall have been developed, using up to seven variables (mostly Mt. Washington data) successively. A method based on 6-hour change in wind and pressure on Mt. Washington yielded the lowest average error, 0.427 in. Further studies of weather elements related to Boston snowfall, a critique of the application of the methods introduced by BRIER and PENN (*see items* 3E–55 and 3E–108 above), and some new methods for statistically testing relationship in a scattergram are included in the three appendixes. *Subject Headings:* **1. Objective forecasting 2. Snow forecasting 3. Boston, Massachusetts. I. Brooks, Charles F. II. Conrad, Victor A. III. Howell, Wallace E. IV. Conover, John H. V. Contract Cwb-8099.**

3E–122 551.509.54

§Counts, R. Corday, Jr., **An objective method of forecasting winter rain for Portland, Oregon.** *Monthly Weather Review*, 77[5]:133–140, May 1949. 13 figs., 2 tables, 7 refs., equations. **DLC**—A highly objective method of forecasting is described in which maps are typed in 5 groups by numerical means. Suitable pressure gradients or other variables which would separate the "rain" from the "no-rain" cases in each type were found. Within each type, maps are separated into finer groups according to exact position of high and low centers and the steepness of the pressure gradient. It is pointed out that this method of forecasting should be used as an aid to, rather than a substitute for, usual forecasting precepts. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Objective weather map classification 4. Portland, Oregon.**

3E–123 551.509.58

Cramer, Owen Putman, **Need for development of objective forecasting methods in fire weather forecasting.** Washington, D. C., U. S. Weather Bureau, Jan. 21, 1949. 3 p. 4 charts. **DWB**—Author makes an urgent plea for the use of existent objective techniques to improve the accuracy of fire weather forecasting and thus to save thousands of dollars. He outlines the different tasks which objective methods may accomplish and describes the basic principles for developing such techniques. *Subject Headings:* **1. Objective forecasting 2. Fire weather forecasting. I. U. S. Weather Bureau.**

3E–124 551.509.59:551.515.4

Cramer, Owen Putman, **Preliminary report: an objective method for forecasting thunderstorms for the Willamette National Forest.** U. S. Weather Bureau, Jan. 18, 1949. 7 p. diagrs. **DWB**—Pairs of parameters were selected with the aim of achieving the greatest possible numerical separation between thunderstorm and non-thunderstorm situations. Independent data were extracted for the 12 best pairs (including 850 mb temperature vs. 500 mb temperature; wind velocity vs. wind direction) and charts prepared and analyzed. By plotting test data on the four best charts, non-thunderstorm cases could be eliminated and a percentage of probability forecast arrived at. Results were encouraging, so further refinement is recommended. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Willamette National Forest, Oregon. I. U. S. Weather Bureau.**

3E–125 551.509.53

Dickey, Woodrow Wilson, **Estimating the probability of a large change in temperature at Pittsburgh, Pennsylvania.** Washington, D. C., U. S. Weather Bureau, Aug. 1949. 16 p. 19 figs., 6 tables. **WB-SRFD**—The location of lowest pressure within a designated area and the position and orientation of cold fronts were used as criteria for determining the synoptic situations at 0130E which are most likely to be followed by a large fall in temperature at Pittsburgh. Consideration of the temperatures and temperature gradients involved and the speed of movement of the air (determined from selected measures of pressure difference) afforded additional stratification. The criteria and probability charts developed showed good accuracy and consistency in use. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Pittsburgh, Pennsylvania. I. U. S. Weather Bureau.**

3E–126 551.509.53

§Dickey, Woodrow Wilson, **Estimating the probability of a large fall in temperature at Washington, D. C.** *Monthly Weather Review*, 77(3):67–68, Mar. **1949.** 18 figs., 8 tables, 6 refs. **DLC**—Author attempts to determine the synoptic situations which are most likely to be followed by a large drop in temperature and to develop a basis for probability statements regarding such an occurrence. Three criteria are chosen for large falls in temperature from the 0130Γ temperature to the minimum the following night: 1) position of center of low pressure, 2) orientation of cold front and 3) position of center of high pressure. Probability charts are developed for cases which meet all three criteria. Forecasting procedures are tested on independent data first, and then objective forecasts are compared with official forecasts. A summary of the steps to be followed to arrive at a probability statement of a large drop in temperature (10° or more) and an estimate of the actual drop if the probability is greater than 50% is found on p. 78. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Probability forecasting 4. Washington, D. C.**

3E–127 551.509.53

§Dickey, Woodrow Wilson, **Estimating the probability of a large temperature fall at Richmond, Virginia. An application to Richmond of the procedures developed for Washington, D. C.** Washington, D. C., U. S. Weather Bureau, April **1949.** 10 p. 10 tables, ref., append. (with 16 figs.). **DWB**—The method devised by the same author (*see item* 3E–126 above) for Washington, D. C. need be changed only slightly to make it usable for Richmond, Virginia. Pressure distribution and frontal orientation can still be used as parameters although the reference stations chosen vary slightly from those chosen for Washington. In the appendix, steps to be followed in estimating the probability of a large fall in temperature are summarized. Eighty-one tests of the objective method show an average error of 4.4 degrees. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Richmond, Virginia. I. U. S. Weather Bureau.**

3E–128 551.509.317:551.509.53

*§Dickey, Woodrow Wilson, **Forecasting the maximum temperature at Cincinnati, Ohio.** Washington, D. C., U. S. Weather Bureau, June 18, **1949.** 8 p. 5 figs., 7 tables, 3 refs., append. **DWB**—A technique of systematic maximum temperature forecasting for "today" and "tomorrow" based on 0630Z or earlier observations was outlined. Precipitation and pressure and frontal pattern forecasts must be made prior to the successful application of the objective method and used as guides in interpreting the validity of the latter for a given case. Objective forecasts for "today" showed no improvement over conventional forecasts but "tomorrow's" forecasts proved worthy of further trial and research. Previous temperature maxima and 850 mb temperature at selected reference stations were used as parameters. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Cincinnati, Ohio. I. U. S. Weather Bureau.**

3E–129 551.509.53

*Dickey, Woodrow Wilson, **An objective aid in forecasting the minimum temperature at Philadelphia, Pa.** *U. S. Weather Bureau, Research Report*, Jan. **1949.** 9 p. 21 figs., tables, equations, append. **DWB**—Using pressure differences between selected stations west of Philadelphia as coordinates, "the temperature change from 0130E to the minimum temperature the following night was plotted at the point determined." From this same chart, probabilities of a drop in temperature were computed. Cases were then classified into groups according to the percentages of probability exhibited, and for each group a "reference station was chosen whose temperature would in general be representative of the air mass expected over Philadelphia 18 to 30 hours after the forecast time." Linear regression equations were computed for each group by the method of least squares. Tests of the equations on two winters of independent data showed favorable results. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Philadelphia, Pennsylvania.**

3E–130 551.509.59:551.575

George, Joseph Johnson, **A brief forecasting study for Kanawha County Airport, Charleston, W. Va.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., July 13, **1949.** 7 p. 5 figs., table. Mimeographed. **DWB**—Peculiarities of the Kanawha Airport with respect to air masses and fog formation are discussed. One year of data is used to establish conditions under which fog is most probable. Wind conditions are the most sensitive criteria for occurrence or non-occurrence; after it has been determined that fog may occur, dew point depression is used to estimate time of formation of fog. A detailed catalog of conditions for each case studied is included. (*Same abstract* as No. 2.1–45 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Charleston, West Virginia. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–131 551.509.317:551.515.127

§George, Joseph Johnson. **On the relationship between the 700 millibar surface and the behavior of pressure patterns at the ground.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., Aug. 1949. 43 p. 14 figs., 3 tables, 9 refs., append. **DWB**—The author's aim is "to separate pressure centers according to their individual characteristics and to provide the forecaster with specific rules by means of which he can choose those which are amenable to treatment by these methods." He contends that once the synoptic situation is classified, future pressure patterns can be forecast with confidence. No objective system for the classification is advanced. *Subject Headings:* **1. Objective forecasting 2. Objective weather map classification 3. Steering. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–132 551.509.5:551.576:629.13

*Gringorten, Irving I., **A study of objective forecasting.** *American Meteorological Society, Bulletin*, 30(1):10–15, Jan. 1949. 3 figs., 5 tables, ref. **DWB**—Meteorological parameters can be divided into predictors and predictands, with the former being used to predict the latter. This report describes a project in which some 20 predictors were used to predict fog and stratus at Randolph Field, Texas, in competition with usual methods of the regular weather station there. The results yielded an overall increase in forecasting accuracy and skill by the objective system. But the most important feature of the objective system is that it enables one to state the probability of occurrence of each event. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Stratus cloud forecasting 4. Randolph Field, Texas.**—*From author's abstract.*

3E–133 551.509.59:551.575

Hanson, Donald M., **An investigation of wintertime stratus and fog at Wichita, Kansas.** U. S. Weather Bureau, Dec. 1949. 7 p. figs., 2 refs. **DWB**—An objective system of forecasting "in terms of probability of occurrence under a given set of wind and moisture conditions" is devised. The simple method (fig. 3) combining only temperature, dew point, and effective wind proved equally as satisfactory as a more complex method involving a large number of variables. *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting 3. Fog forecasting 4. Wichita, Kansas. I. U. S. Weather Bureau.**

3E–134 551.509.54

*§Hawkins, Harry F., Jr., **Objective techniques for interpreting mean circulation patterns in terms of precipitation.** Washington, D. C., U. S. Weather Bureau, Extended Forecast Section, Oct. 1949. 34 p. 18 figs., 5 tables, refs., append. Manuscript. **DWB**—It is concluded that "an acceptable objective interpretation can be made but that it may very well be impractical as a part of the forecast routine." A time-consuming detailed study of the mean circulation by small sections of the country would be necessary to improve the results obtained objectively. In the appendix, the forecast graphs are summarized and the pertinent parameters tabulated. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting. I. U. S. Weather Bureau. Extended Forecast Section.**

3E–135 551.509.3:551.515.4

Hosler, Charles L., **The use of pyrheliometer records in objective weather forecasting.** *American Geophysical Union, Transactions*, 30(2):211–214, April 1949. 2 figs., 3 tables, 7 refs. **MH-BH**—The amount of solar and sky radiation received on a horizontal surface is used for objective forecasting of summer thunderstorms and shower type precipitation. Methods for establishing a radiation value which is critical for precipitation and ways of evaluating the records used in forecasting are explained. The results of forecasts made on this basis over a period of seven years, for the months of June, July, and August, show appreciable skill above chance. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Pyrheliometers.**—*From author's abstract.*

3E–136 551.509.54

Jermin, T. E., **Additional tests of Count's objective method of forecasting winter rain for Portland, Oregon.** *Monthly Weather Review*, 77(5):140–142, May 1949. 2 tables. **DLC**—COUNT's (1949) method was tested as an aid to forecasting precipitation 24–28 hours after map time in Seattle, Washington. Lower verification scores can partly be explained by: 1) a longer forecast period, 2) an extreme winter and 3) verification of forecasts made on two maps daily instead of one. For other stations (e.g., Spokane, Boise) where precipitation is not so closely related to the lower part of the atmosphere as it is in Portland, Oregon, it may be necessary to correlate upper air data. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Seattle, Washington.**

3E–137 551.509.54:63

§Jorgensen, Donald L., **An objective method of forecasting rain in central California during the raisin drying season.** *Monthly Weather Review*, 77(2):31–46, Feb. **1949.** 28 figs., 5 tables, 4 refs. **DWB**—Maps are classified into four types according to synoptic conditions present which generally result in precipitation. Following classification the next step in the method is to choose and combine for each class the meteorological variables indicative of rainfall. Convergence in low and intermediate levels, together with temperature and moisture measurements are found better indexes for forecasting than variables related to orographic or frontal effects. Although the actual value was difficult to estimate, it is felt that the contribution of this method to the forecasts in the 1947 season was considerable. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Probability forecasting 4. Agricultural meteorology 5. California.**

3E–138 551.509.317:551.509.532

§Kenny, Howard S., **Frost and low temperatures in the Wisconsin cranberry bogs.** Chicago, Ill., U. S. Weather Bureau, Jan. **1949.** 29 p. 30 figs., table, 7 refs. Manuscript. **DWB**—The paper represents the culmination of three years of investigations carried on at Chicago Forecast Center. A forecast tool is constructed for the use of all local forecasters who must deal with the Wisconsin bog problem. Humidity data and local factors are evaluated empirically in an objective fashion to forecast the minimum temperature for a key station. Regression lines can then be established to provide estimates of corresponding temperatures at specific bogs. Results obtained from the forecast tool must be modified subjectively. *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Agricultural meteorology 4. Wisconsin. I. U. S. Weather Bureau.**

3E–139 551.509.33:551.577

Klein, William H., **Recommended procedure in preparing forecast of five-day winter precipitation anomaly in the Tennessee Valley from the mean 700 mb prognostic map.** U. S. Weather Bureau, Extended Forecast Section, **1947.** *Idem.*, **An objective method of forecasting five-day precipitation for the Tennessee Valley.** *U. S. Weather Bureau, Research Paper* No. 29, **1949.** 60 p. 17 figs., 14 tables, 37 refs., 16 equations, append. **DWB**—The forecasts of the mean zonal 700 mb circulation were successfully applied to forecasting the 5-day rainfall in Tennessee Valley but have a wider application. Parameters used are: air trajectory, prevailing storm path, local precipitation index, measures of convergence, distance from trough or ridge. Forecasting graphs are given. (*Same abstract* as No. 2A–139 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Extended forecasting 4. Tennessee Valley. I. U. S. Weather Bureau. Extended Forecast Section.**—*C.E.P.B.*

3E–140 551.509.33

Lönnquist, Olov, **The numerical prediction method for upper air profiles tried on some regular type profiles.** *Tellus*, 1(4):53–57, Nov. **1949.** 6 figs., 2 tables, 3 refs., 2 equations. **DWB**—Charney and Eliassen's numerical methods of predicting height of 500 mb surface 24 hours ahead are modified and extended to provide for 48 hour predictions of certain simple wave patterns. Sinusoidal and quasi-sinusoidal profiles are discussed and illustrated, and attempts are made in the tests at superimposing two profiles on each other. Deepening can be accounted for in three different ways by this method. (*Same abstract* as No. 4–32 in April 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Mathematical forecasting 3. Upper air charts 4. Waves in the westerlies.**—*M.R.*

3E–141 551.509.317:551.509.33:551.509.53

§Martin, Donald E., **Objective procedure for preparing long-range temperature forecasts.** U. S. Weather Bureau, Extended Forecast Section, Research Report, Jan. **1949.** 18+p. 19 figs., 2 tables, 6 refs. **DWB**—The technique of graphic correlation yielded a system for an objective interpretation of monthly mean 700 mb charts in terms of surface temperature anomalies. Using observed monthly data, anomaly charts were correctly translated into temperature fields 60% of the time (96% for hits within one class). The technique is simple to apply and is currently used in monthly and five-day forecasting routines. In addition to heights anomaly and vector flow, the introduction of a third parameter (changes from the initial temperature field or the thickness anomaly at the source of the trajectory) must be considered for shorter-term forecasts, p. 17–18. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Long range forecasting. I. U. S. Weather Bureau. Extended Forecast Section.**—*From author's abstract.*

3E–142 551.509.317:551.509.54

Miller, Sanford R., **An objective approach to precipitation forecasting in Northeast Colorado.** Denver, Col., U. S. Weather Bureau, Airport Station, Sept. **1949.** 18 p. 14 figs., 5 refs. Manuscript. **DWB**—The case to be forecast is first classified by a definite set of rules as a *P* (precipitation)

or *NP* (no precipitation) case or variation thereof. For one case type, surface and upper air indexes are computed from barometric readings at a grid of selected stations and the station forecast based on the relation between its pressure and the indexes. For another case type only the sea level pressure at Salt Lake City is considered and for a third a knowledge of the position of the low center is necessary to make the objective forecast. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Colorado. I. U. S. Weather Bureau.**

3E–143 551.509.3:016

†Mook, Conrad Payne, **A bibliography of pre-war Japanese literature in English on systematic and objective methods of weather forecasting for the Japanese Islands.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, April **1949.** 4 p. **WB-AS**—The references included are taken from the *Geophysical Magazine*, Tokyo, and the *Met. Soc. of Japan, Journal*. All items are annotated. *Subject Headings:* **1. Objective forecasting 2. Bibliographies 3. Japan. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–144 551.509.3(09)

Mook, Conrad Payne, **A historical note on the development of systematic procedures for short range weather forecasting.** Washington, D. C., U. S. Weather Bureau, Airport Station, **1949.** 6 p. 15 figs., 6 refs. **WB-AS**—Attention is called to the fact that the period, 1895–1906, was a particularly active one in the development of objective forecasting techniques. The contributions of THOMAS RUSSELL, JOHAN AUGUST UDDEN and LOUIS BESSON to the field are commented upon. Maps, graphs, and charts illustrative of the work of those three men are included. *Subject Headings:* **1. Objective forecasting 2. Short range forecasting 3. History of meteorology. I. U. S. Weather Bureau.**

3E–145 551.509.31

Panofsky, H. A., **Objective weather-map analysis.** *Journal of Meteorology*, 6(6):386–392, Dec. **1949.** 13 figs., 2 tables, 2 refs., 3 equations. **DWB**—A comparison of objective and subjective methods of analyzing wind and pressure fields with an example from a situation in the Eastern United States on Dec. 2, 1945. Objective analysis involved determination of pressures above given coordinates with a minimum of smoothing (to eliminate local or temporary irregularities or observational errors). This method satisfactory for determining pressure contours, streamlines, horizontal divergence and vertical velocities and fairly satisfactory for computing pressure gradients, but geostrophic deviations can only be determined reliably by falling back on subjective interpretations of apparent tendencies vs. possible errors or insufficiencies of data or smoothing methods. (*Same abstract* as No. 3–30 in March 1950 *Meteorological Abstracts*.) *Subject Headings:* **1. Objective forecasting 2. Synoptic analysis.**—*M.R.*

3E–146 551.509.317:551.509.54

*§Price, Saul, **A preliminary study of summertime quantitative precipitation forecasting in eastern Kansas.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, Jan. **1949.** 51 p. 24 figs., 9 tables, 23 refs. **WB-SRFD**—Climatological material and other information helpful in understanding the problem and the approach to it are presented. Through the use of persistence and the graphical combination of certain numerical indexes of moisture advection and the cross-isotherm flow, an objective procedure is developed for forecasting the density of rainfall in eastern Kansas during the summer months. Some results are given for tests made on independent data. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Kansas. I. U. S. Weather Bureau. Short Range Forecast Development Section.**—*Author's abstract.*

3E–147 551.509.3:551.515.4

Price, Saul, **Thunderstorm today? Try a probability forecast.** *Weatherwise*, 2(3):61–63, June **1949.** 4 figs. **MH-BH**—The problem is to determine not merely whether a general connection can be found between selected meteorological factors and subsequent thunderstorms, but also how strong that relationship is. Smoothed curves show how, if the proportion of certain constancy in weather relationships is assumed, the smoothed curves of thunderstorm frequencies may also be regarded as representing future thunderstorm probabilities. *Subject Headings:* **1. Objective forecasting 2. Probability forecasting 3. Thunderstorm forecasting.**

3E–148 551.509.317:551.509.54

Rapp, R. R., **On forecasting winter precipitation amounts at Washington, D. C.** *Monthly Weather Review*, 77(9):251–256, Sept. **1949.** 2 figs., 6 tables, 6 refs. **DWB**—After first eliminating cases where precipitation was unlikely due to the absence of active precipitation west of Washington, RAPP evaluated the strength of the southerly components of flow using as one element some 850

mb height differences along a straight line connecting Charleston, S. C. and Little Rock, Ark. The skill of the method was tested on independent data and for snow cases. To simplify computations involved in using the objective statistical formula, a nomograph was devised. Suggestions were given for further work on the method. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Forecast verification 4. Washington, D. C.**

3E–149 551.509.3

Rapp, R. R., **The use of graphical methods in developing forecast aids.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, Sept. **1949.** 7 p. fig., 6 refs., equations. Manuscript. **WB-SRFD**—The author's aim is to emphasize and clarify a graphical technique of statistical weather data analysis which has led to the development of several successive forecast tools. The method is important to objective forecasting because it provides a means of giving quantitative interpretation to useful qualitative results of theory and synoptic experience. The element to be forecast must be defined numerically and numerical indexes prepared to place the ideas useful in forecasting on a quantitative basis. Indexes and element can then be related by the graphical technique. *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–150 551.509.59:551.591:629.13

§Strickler, R. F., **A preliminary investigation of the forecasting of low ceiling and visibility at Chicago Municipal Airport.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorology Dept., Nov. **1949.** 21 p. 8 figs., tables, 6 refs. Mimeographed. **DWB**—This report embodies the first published results of a study which will eventually include an analysis of and forecasting procedure for all weather situations which cause sub-minimum ceiling or visibility at Chicago (less than 300 ft or $\frac{3}{4}$ mile, or less than $\frac{1}{2}$ mile with unlimited ceiling). The study at this time is limited to pre-warm frontal and warm frontal passage situations for the winter season and radiation fog throughout the year. Variables such as dew point, temperature, wind velocity, and radiation are chosen to classify the data. *Subject Headings:* **1. Objective forecasting 2. Visibility forecasting 3. Airways forecasting 4. Chicago, Illinois. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–151 551.509.3:629.13

†U. S. Weather Bureau, **Terminal weather at Los Angeles, California.** Los Angeles, Calif., U. S. Weather Airport Station, Dec. **1949.** 26 p. 2 plates, charts, tables, 16 refs. **DWB**—This report is a summary of and commentary on previous objective forecasting studies, particularly those dealing with the Los Angeles area. *Subject Headings:* **1. Objective forecasting 2. Los Angeles, California. I. Corwin, H. G.** (*comp.*).

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3E–152 551.509.54

§Battan, Louis J., **Further studies on forecasting the occurrence of showers and thunderstorms in southwestern Ohio.** U. S. Weather Bureau, June **1950.** 11 p. 7 figs., 5 refs., append. **DWB**—Upper air measurements are incorporated into the objective forecast system developed earlier by PALMER for the same region. A map typing system is described which acts as an indicator of the dynamic effects of the flow pattern. On scatter diagrams with thermal stability plotted vertically and the moisture index horizontally, smooth curves are drawn to separate probable and improbable shower and thunderstorm areas. Skill scores from this method on independent data showed improvement over PALMER'S. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Southwestern Ohio. I. U. S. Weather Bureau.**

3E–153 551.509.317:551.577

§Beebe, Robert G., **Forecasting winter precipitation for Atlanta, Ga.** *Monthly Weather Review,* 78(4):59–68, April **1950.** 8 figs. (incl. 4 synoptic charts), 2 tables, 3 refs. **DWB**—Moisture, temperature advection and flow pattern data for two winters (1945–1947) for the 850 and 700 mb levels are used as parameters for preparing forecast graphs which have proven by checking against independent data (2 winters) to increase the accuracy and decrease the large errors in rainfall forecast for the Atlanta area. Other variables were tested with less success. Cases divided into those with strong and those with weak gradients. (*Same abstract* as No. 8-24 in Aug. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Atlanta, Georgia.**—*M.R.*

3E–154 551.509.3:551.515.4

§Beers, Francis D., **Summer thunderstorm forecasting for the Ochoco and Malheur forests of Oregon.** Pendleton, Ore., U. S. Weather Bureau, May **1950.** 13 p. 17 figs., 3 tables, 5 refs. Mimeographed. **DWB**—Preliminary report on an objective method for predicting the fire hazard (from thunderstorms) in the subject area, for a 24 hr period (midnight to midnight) from data

available at Pendleton, Oregon, in the late afternoon of the preceding day. Cases are stratified into three situations depending upon the flow patterns aloft: 1) S.E. 2) S.W. 3) Stagnant. Variables are selected for each situation and the resulting scattergrams are delineated into "thunderstorm" and "no thunderstorm" areas. July and August of five summer seasons are used, five of the months for development and five for testing. Eighty-two percent of all cases were correctly forecast within the problem specifications, with a skill score of .57. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Fire weather forecasting 4. Pendleton, Oregon. I. U. S. Weather Bureau.**—*U. S. Weather Bureau abstract.*

3E–155 551.509.31:551.575.1

Berkofsky, Louis, **An objective determination of probability of fog formation.** *American Meteorological Society, Bulletin*, 31(5):158–162, Mar. 1950. 4 figs., 2 refs., equations. **DWB**—Methods used previously in forecasting rainfall or thunderstorms (*see item* 3E-106 above) are applied to fog forecasting. Any number of parameters can be used, but in this study the probability of fog occurring during the night is determined from 6 elements observed at sunset, taken in pairs. (Wind speed vs. dew point depression, stability vs. wind shear, and dew point gradient vs. tenths of low cloud cover.) The three computed probabilities are then plotted and the forecast probability taken from this (linear) curve. Verification shows a fair success, but could be improved by selecting the *best* parameters. (*Same abstract* as No. 7-25 in July 1950 *Meteorological Abstracts*.) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting.**—*M.R.*

3E–156 551.509.3:551.578.4

Blue Hill Meteorological Observatory, **Mt. Washington and Blue Hill aids to snowstorm forecasting for Boston.** Contract Cwb-8120. Final Report, 1949–1950, on Snowstorm Phase, Sept. 26, 1950. 53 p. 13 figs., tables, 8 refs. Typescript. **MH-BH, DWB**—Snowstorms which occurred during 12 years are analyzed according to seasons and synoptic types 6 hours in advance, according to depth or intensity of the snowstorm, air flow or temperature at Mt. Washington, etc., and similar analysis made of 5 other years of data to check the reliability of the objective forecasts. As a result of the selection of the proper parameters, high accuracy could be expected for six hour snowfall forecasts. Considerable attention was paid to the correction of temperature and the nature of the relation between surface and free air temperatures on Mt. Washington. Incidental studies were made of the eddies in the lee of Mt. Washington, the mechanism of snowstorms in Japan and Scotland as compared with those in New England, etc. A detailed statistical and graphic study. (*Same item* as No. 2.1-41 in Jan. 1951 *Meteorological Abstracts*.) *Subject Headings:* **1. Objective forecasting 2. Snow forecasting 3. Massachusetts. I. Brooks, Charles F. II. Conrad, Victor A. III. Contract Cwb-8120.**

3E–157 551.509.34:551.524.37

Brablec, Josef, **Předpověď nočních mrazů podle Sinjavského.** [Forecasts of nocturnal frosts according to Sinjavsky.] *Meteorologické Zprávy*, 4(1-2):35–36, **1950.** table. **MH-BH**—In Czechoslovakia, forecasts of nocturnal frosts were hitherto based on the dewpoint. This method, however, can be applied with success under stable conditions only. SINJAVSKY worked out a method based on temperature at 9 p.m. and its tendency between 2 and 9 p.m., on the wind during the same period and cloudiness at night. Independently from these values a forecast based on relative humidity is added. The table also provides for corrections on account of precipitation or thunderstorms. Although this method has been worked out for the station at Syktyvkar it can be applied to other places with some corrections based on elements of their microclimate. A few examples are given. *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Nocturnal cooling 3. Czechoslovakia.**—*G.T.*

3E–158 551.509.317:551.509.53

Chakravortty, K. C., **Discussions on a method of predicting night minimum temperatures in winter.** *India, Meteorological Dept., Scientific Notes*, 11(135):39–46, **1950.** 3 tables, equation. **DWB**—Analysis of 3 hourly observations at New Delhi, Bareilly and Bamrauli indicates that a simple empirical formula can be used to forecast night minimum temperature if there is no air mass change. In the formula, there is a constant which depends on location, average low cloudiness, and average wind force at night. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. India.**—*U. S. Weather Bureau abstract.*

3E–159 551.576.4:629.13:551.509.3

Crutcher, Harold L., Hunter, James C., Sanders, Robert A. and Price, Saul, **Forecasting the heights of cumulus cloud-tops on the Washington-Bermuda airways route.** *American Meteorological Society, Bulletin*, 31(1):1–7, Jan. **1950.** 7 figs., table, 7 refs., equations. **DWB**—The vorticity index computed from 700 mb charts was selected as the variable giving the highest correlation with

the height of cumulus cloud tops on the Washington-Bermuda Airway. Basic sample was 454 observations of cloud tops made by pilots on this airway during 1945, and test data consisted of 210 similar observations during 1946 and 1947. Seasonal trend in slope of regression line was so pronounced that when smoothed there was a close fit of the regression line to the original data for any given month, and when test data were used the correlation was still significantly high indicating usefulness of this index as an objective forecasting tool. Methods of computing index, cloud top frequencies. (*Same abstract* as No. 4–25 in April 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Vorticity 3. Airways forecasting 4. Cloud forecasting 5. Methods of computation 6. North Atlantic.**—*M.R.*

3E–160 551.509.3:551.575:629.13

Farthing, E. D., **Forecasting low stratus and fog at Kansas City, Missouri.** [*TWA Meteorological Bulletin* No. 48–4, **1950.**] 6+p., graphs. **DWB**—Stratus or fog forecasting rules and aids for Kansas City Airport, based on records for the winter of 1947–48, are presented. Gradient wind direction and force across Kansas City are the primary tools. No fog formed with surface winds of more than 10 mph or with a direction from SW to NW. Most cases of less than 400 ft–1 mile conditions occurred within 18 hours of a gradient from NNE to SSW with a strength of 5 mb or less. With these conditions sub-minimum weather occurred 42% of the time. Increased gradient lowers chances of fog, and snow cover postpones formation of fog by as much as 7½ hours. Methods of forecasting time of formation or dissipation are discussed. *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Stratus cloud forecasting 4. Airways forecasting 5. Kansas City, Missouri.**—*M.R.*

3E–161 551.509.31:551.578

Gentry, Robert C., **Forecasting local showers in Florida during the summer.** *Monthly Weather Review*, 78(3):41–49, **1950.** 11 figs., 3 tables, 9 refs. **DWB**—Records show that there is a shower somewhere in Florida nearly every day in summer. Hence, the forecast "scattered showers" which is most frequently issued, is generally accurate but meaningless. By analyzing rainfall records for five years from 10 stations in a radius of 25 miles from Miami, and correlating various categories of shower density on given days with other parameters (relative humidity, proximity to 700 mb trough or ridge, curvature of upper level contours, locations of nearest easterly wave or tropical storm, and general trajectory of air approaching Miami) it was possible to construct forecast graphs or nomograms which allow issuance on a rational basis of forecasts indicating the actual percentage probability of a shower near Miami. Data for 5 months were checked against five months of independent data, showing skill score of 55 or that the forecasts were correct 86% of the time. (*Same abstract* as No. 8–25 in Aug. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Miami, Florida.**—*M.R.*

3E–162 551.576.12:551.509.3

Gifford, Frank, Jr., **Forecasting the heights of formation of stratus clouds.** *American Meteorological Society, Bulletin*, 31(2):31–37, Feb. **1950.** 4 figs., table, 14 refs., 3 equations. **DWB**—Eliminating cases of stratus which occur with precipitation or on a change from land to sea breeze, the author compiles and analyzes the data on the relation of wind speed and nocturnal cooling to heights of stratus layer, and presents it in descriptive and graphical form with reference to the "roughness length" parameter. From these scatter diagrams one can see at a glance how often clouds might form before or below the ideal time or heights as calculated from theoretical equations. Also some evidence of theoretical possibility of stratus forming at very low levels or on the surface with high winds (as in the Aleutians or at Cheyenne), is adduced. Humidity was not considered in this study. (*Same abstract* as No. 4–104 in April 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting.**—*M.R.*

3E–163 551.509.3

Gringorten, Irving I., **Forecasting by statistical inferences.** *Journal of Meteorology*, 7(6):388–394, Dec. **1950.** 3 figs., 10 refs., 3 equations. **MH-BH**—A method of using the probability of meteorological events for objective forecasting by statistical methods for operational needs is presented. The forecast requirements are represented by critical frequencies and their determination is described. From a knowledge of the statistical frequencies of the meteorological events to be forecast, or predictands, and of the antecedent conditions, or predictors, prediction can be made by inference. The determination of the probability and confidence limits of predictands and predictors is described; the application of predictor combinations to forecasting is illustrated; a modification of TSCHUPROW's coefficient of contingency is developed for evaluating objectively the efficiency of predictor combinations. The author points out that this technique of objective forecasting is essentially similar to the procedure of subjective forecasting. (*Same abstract* as No. 2.4–29 in April 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting.** —*I.L.D.*

3E–164 551.509.319:551.513

Grytøyr, Elias. **A method of selecting analogous synoptic situations, and the use of past synoptic situations in forecasting for East-Norway.** *Geofys i ke Publikasjoner*, 17(9), 1950. 28 p. 10 figs., 36 text. plates, tables. DWB—A well-developed scheme is presented for classification of synoptic charts from the point of view of the relation of neighboring frontal and weather conditions or types to a single station or area. Applications to analysis and analog forecasting for Oslo are provided as a test of the method, and the results of statistical verification of two test cases against official forecasts are presented in detail. The system is based on about 50,000 analyzed synoptic charts (1920–1940) and the classification of each day during that period is given by months in large fold-in charts in the back of the publication. (*Same abstract* as No. 2.5–40 in May 1951 *Meteorological Abstracts.*) *Subject Heading:* 1. Objective forecasting 2. Analog selection 3. Synoptic analysis 4. Norway.—*M.R.*

3E–165 551.576.12:551.509.59

Handy, Burton, Jr., **Forecasting winter-time stratus at Kansas City, Mo.** *American Meteorological Society, Bulletin* 31(2):38–43. Feb. 1950. 3 figs., tables, 6 refs. DWB—From a scatter diagram showing cases of stratus (ceiling 1,500 ft or less) and no stratus, with various temperatures and dew points, and another showing occurrences with various wind directions and speeds, a composite chart is compiled showing probability of stratus formation, and the 40% probability isopleth is used as the critical value for forecasting whether or not stratus will form between 0430 and 1230C at Kansas City. Cases falling between 20% and 60% are apt to be difficult to forecast; those above 60% are quite reliable for forecasting stratus; those below 20% almost sure bets for a no-stratus forecast. Method tested for six winter months giving accuracy of 76% and skill score chance of 32%, not as good as subjective Weather Bureau forecasts but useful as a tool for doubtful cases. (*Same abstract* as No. 4-105 in April 1950 *Meteorological Abstracts.*) *Subject Headings:* 1. Objective forecasting 2. Stratus cloud forecasting 3. Kansas City, Missouri.—*M.R.*

3E–166 551.509.317:551.509.52

Hibbard, Charles, Jr. and Lindquist, H. D., **Forecasting easterly winds in the Columbia River Gorge during the spring and autumn months.** Seattle, Wash., U. S. Weather Bureau, 1950. 11 p. 9 figs., 14 refs., append. Manuscript. WB-SRFD—The problem of forecasting easterly winds during the spring and autumn for Western Washington and Northwestern Oregon is discussed from both fire-producing and meteorological standpoints. A number of parameters are tested for value as objective indicators of wind and humidity for the next day for a representative station. A system involving six parameters is described which on a categorical forecast of strong east wind or no strong east wind was correct 84% of the time with a skill score of .56 for dependent data. The comparison with current forecasting techniques was subjective and no test on independent data was presented. *Subject Heading:* 1. Objective forecasting 2. Fire weather forecasting 3. Oregon 4. Western Washington. I. U. S. Weather Bureau.—*U. S. Weather Bureau abstract.*

3E–167 551.509.3

Hollman, Günther, **Zur numerischen Wettervorhersage.** [On numerical weather forecasting.] **Bericht über** [Report on] **J. G. Charney, R. Fjörtoft, J. v. Neumann: Numerical integration of the barotropic vorticity equation.** *Tellus*, 2(4), 1950. *Zeitschrift für Meteorologie* 4(11):342–345, Nov. 1950. 3 equations, 3 refs. DWB—A discussion of the possibility of improving forecasts by introducing mathematical methods. Rossby's barotropic field theory is considered but complete barotropy does not fully represent cyclonic conditions. Charney and Eliassen's equations give good results at 500 mb level. Electronic computing on a model sufficiently complicated to represent the real atmosphere (Princeton Institute for Advanced Study) may realize Richardson's "dream." (*Same abstract* as No. 3.3–56 in March 1952 in *Meteorological Abstracts.*) *Subject Headings:* 1. Objective forecasting 2. Mathematical forecasting 3. Vorticity.—*C.E.P.B.*

3E–168 551.509.3:551.575

Hoover, Robert A., **Forecasting radiation fog at Elkins, W. Va.** *Monthly Weather Review*, 78(5):75–80, May 1950. 9 figs., 2 tables, 5 refs. DWB—Gradient wind speed, sunset dry-bulb and dew point depression were used as the most indicative parameters in setting up an objective system of forecasting fog at Elkins, W. Va. Nomograms prepared for evaluating conditions and results of test for verification are presented and discussed. Nine conclusions which might be used as "rules of thumb" are also presented. Effect of topography indicated by charts and diagrams. Fog forms most frequently on clear nights during prevalence of Atlantic air (easterly gradient) in July, August and September, and rarely when the gradient is from north through west to south in winter (continental air). (*Same abstract* as No. 11–34 in Nov. 1950 *Meteorological Abstracts.*) *Subject Headings:* 1. Objective forecasting 2. Fog forecasting 3. Elkins, West Virginia.—*M.R.*

3E–169 551.509.317:551.509.52

Huntoon, James K., **Forecasting strong northwesterly winds in the Los Angeles Basin with the aid of the 500 millibar chart.** Los Angeles, Calif., U. S. Weather Bureau Airport Station, March 1950. 5 p. 3 figs., ref. **DWB**—An attempt is made to forecast the beginning of northwest storms 12 to 36 hours in advance using the 500 mb chart exclusively. Meridional height and temperature gradients of the ideal nor'wester-producing 500 mb pattern were determined and used as standard for probability forecasting in test cases. Results of tests on independent data are included. *Subject Headings:* **1. Objective forecasting 2. Fire weather forecasting 4. Wind forecasting 5. Los Angeles, California. I. U. S. Weather Bureau.**

3E–170 551.509.34:551.524.37:551.501.6

Lessmann, H., **Ein Beitrag zum Problem der Vorhersage von Nachtfrösten und Strahlungsnebeln.** [A contribution to the problem of forecasting night frosts and radiation fogs.] *Baden. Landeswetterdienst, Jahresbericht mit Abhandlungen*, 1950. p. 46–52. 4 figs., 6 tables, 4 refs. **DWB**—The author discusses critically the use of tephigram by FAUST for predicting night frost and radiation fogs. The method is regarded as unreliable and cumbersome. The author then proposes a modification of the KAMMERMANN rule by taking into consideration the degree of continentality of the climate of a particular locality. (*Same abstract* as No. 2.9–44 in Sept. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 4. Tephigrams.**—*I.L.D.*

3E–171 551.509.54

§Lothman, A. A., **Forecasting of rain in Fresno during October.** Fresno, Calif., U. S. Weather Bureau, Jan. 19, 1950. 5 p. 10 figs., 2 equations. **DWB**—Maps are classified into four distinct types according to the relationship between the meridional and zonal indexes as indicated by the surface pressure distribution. Pressure differential between two chosen stations or pressure change in a given time period at one station combined with the distance of the nearest storm center are used as factors to separate the "rain" from the "no rain" days on scatter diagrams. Tests on Sept. data for five years showed a skill score of 56%. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Fresno, California. I. U. S. Weather Bureau.**

3E–172 551.513.2:551.509.5

Martin, Donald E. and Hawkins, Harry F., Jr., **The relationship of temperature and precipitation over the the United States to the circulation aloft.** *Weatherwise*, 3(3):65–67, June 1950. 3 figs. **MH-BH**—The use of composite charts of 700 mb height anomalies to study the circulation over North America and to make objective forecasts based on typical anomalies which occur at the time of extreme summer or winter temperatures at Denver, Evansville and Boston. (*Same abstract* as No. 10–67 in Oct. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. General circulation 3. United States.**—*M.R.*

3E–173 551.509.33:551.577

Martin, Donald E. and Hawkins, Harry R., Jr., **Forecasting the weather—the relationship of temperature and precipitation over the United States to the circulation aloft. Studies of winter precipitation.** *Weatherwise*, 3(6):138–141, Dec. 1950. 8 figs. **MH-BH**—The use of composite "wet" and "dry" maps for forecasting rainfall is discussed and illustrated by charts prepared for Norfolk, Va., Fort Worth, Tex. and Eureka, Calif. Parameters used are 5-day average 500 mb contours for North America and thickness (departure from normal) associated with the 10 wettest and 10 driest (for the station in question) periods in 3 winters. (*Same abstract* as No. 2.3–30 March 1951 in *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Extended forecasting 4. United States.**—*M.R.*

3E–174 551.509.3 551.509.54

Miller, Sandford R. and Dickey, Woodrow Wilson, **An objective method of forecasting wintertime precipitation in northeast Colorado.** *Monthly Weather Review*, 78(9):161–169, Sept. 1950. 11 figs., 7 tables, 7 refs. **DWB**—A method for forecasting precipitation during the summer from 12 to 36 hours in advance for northeastern Colorado is presented. The selection of variables which precede the formation of upslope at the surface or indicate the continuation of upslope flow is discussed. The variables are combined by a method of graphical correlation. The application of the precipitation forecasting method is illustrated when applied to independent data, a skill score above chance of fifty percent is obtained. (*Same abstract* as No. 2.9–39 in Sept. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Colorado.**—*I.L.D.*

3E–175 551.509.53

*§Mook, Conrad Payne. **An aid in forecasting minimum temperatures at Columbus, Ohio in winter.** Washington, D. C., U. S. Weather Bureau Airport Station, Nov. 1950. 2 p. 8 figs., 2 tables, equations. **WB-AS**—The report is an actual working tool in current use at the Washington National Airport. Author utilized an approximation of a westward projection of DICKEY's (*see item* 3E–129 above) Philadelphia grid employing the same parameters of pressure and temperature observed at different stations on the 0130E surface charts. Provision is made for the special case in which there is active overrunning over a nose of high pressure which extends from the great plains toward the Gulf. Test sheets of 1951 winter data show the objective results to be about comparable to the subjective in forecasting for the 12-hr period ending at 0730E the next day (30 hours later). *Subject Headings:* 1. Objective forecasting 2. Temperature forecasting 3. Columbus, Ohio. I. U. S. Weather Bureau.

3E–176 551.509.3:551.575

Mook, Conrad Payne. **Some remarks concerning Taylor's fog prediction diagram.** *American Meteorological Society, Bulletin*, 31(6):206–209, June 1950. 9 figs., 6 refs. **MH-BH**—TAYLOR'S famous diagram for predicting fog, which was based on plotting cases of fog and no fog at Kew on coordinates of 8 p.m. temperature and dew point depressions, and separating the bulk of cases by a line which yielded a *fog not expected* and *fog expected* area, is refined by drawing lines of fog frequency (25%, 50% and 75% expectancy). These lines take on a much different shape than TAYLOR's, and are more reliable. They indicate that along a line of constant dew point depression, the percentage frequency of fog decreases above 50°F and below 40°F at Kew. The cause is considered by independent theoretical analysis based on BRUNT's minimum temperature formula and PETTERSSEN's Mist Interval, suggesting a re-drawing of TAYLOR'S prediction line. (*Same abstract* as No. 8–23 in Aug. 1950 *Meteorological Abstracts*.) *Subject Headings:* 1. Objective forecasting 2. Fog forecasting 3. Taylor diagram.—*M.R.*

3E–177 551.509.317:551.509.54

Palmer, Wayne St. Clair. **On precipitation forecasting at Washington, D. C.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, Aug. 1950. 44 p. figs. tables, charts. Manuscript. **WB-SRFD**—System is designed to standardize the multiple processes a forecaster uses. Its criteria for "rain" or "no rain," being stated in probabilities depending upon "synoptic" situations, allow the forecaster to remain in "touch" with the physical picture of the weather and therefore theoretically permit him to improve on the semi-objective forecast through his knowledge of the details of a particular situation. *Subject Headings:* 1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C. I. U. S. Weather Bureau. Short Range Forecast Development Section.—*A.F.*

3E–178 551.509.317:551.509.54

§Price, Saul. **Estimating the daily average depth of summer rain in eastern Kansas.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, 1950. 9 p. 14 figs., 3 tables, 6 refs. **WB-SRFD**—Combining an advective moisture index and a cross-isotherm index by means of the graphical technique used in an earlier study (*see item* 3–146 above) the author can forecast daily rainfall density for the subject area. In this study, for the convenience of users, he converts his forecast into terms of average depth of rain expected. *Subject Headings:* 1. Objective forecasting 2. Precipitation forecasting 3. Kansas. I. U. S. Weather Bureau. Short Range Forecast Development Section.

3E–179 551.509.3:551.577

Rao, D. V., Sarma, V. Vittal, and Lal, S. S., **Studies on forecasting local rainfall in India with the help of precipitation index.** *Indian Journal of Meteorology and Geophysics*, 1(2):105–115, April 1950. 3 figs., 7 tables. **DWB**—Radiosonde data for Madras, New Delhi and Nagpur have been analyzed by SCHELL's statistical method ($I = \langle w, L \rangle$, and the results presented in tables and graphs. It is concluded by each of the authors, working independently, that this method will greatly increase the accuracy of 12 hour forecasts for certain sections of India, especially at times of high or low index values. Results differ among the three stations and from the results of SCHELL for New England, but this can be accounted for by differences in intensity and type of precipitation. Usually the index gives a guide to the amount or intensity of rainfall. The few cases which proved outstanding failures are examined and explained either synoptically or by the fact of heavy showers having just ended at the time of the radiosonde ascent. (*Same abstract* as No. 7–24 in July 1950 *Meteorological Abstracts*.) *Subject Headings:* 1. Objective forecasting 2. Precipitation forecasting 3. Single station forecasting 3. Radiosondes 5. India.—*M.R.*

3E–180 551.509.317:629.13

*Roche, Robert D., **Short range aeronautical forecasting at Cleveland Airport, Cleveland, Ohio.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1950.** 39 p. 13 figs., tables, 6 appends. **DWB**—A detailed analysis is made of the peculiarities of weather at the Cleveland Airport caused by the proximity of Lake Erie. Post-cold frontal, pre-warm frontal, advection fog, and radiation fog weather conditions are discussed in detail. In each case objective guides are presented to aid in forecasting below-minimum weather, time of lowering, type of weather, lowest weather, and duration of below-minimum conditions. The best variables were found to be post-frontal streamline direction of the air, post-frontal temperature (as compared with lake temperature), insolation, and dew point depression. In the appendices, post cold and warm-frontal cases are cataloged. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Cleveland, Ohio. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–181 551.509.3:551.575:629.13

§Roche, Robert D., **Yip Oxo weather, an investigation of below-minimum weather conditions at the Willow Run Airport, Ypslanti, Michigan.** Atlanta, Ga., Eastern Air Lines, Inc., Meteorological Dept., **1950.** 31 p. 11 figs., 2 tables, 4 refs., append. **DWB**—Fog situations during 1947–50 are classified into pre-warm frontal, air mass and mixing radiation fog, and each of those classes broken down by types and months. Typical cases are discussed and sample synoptic charts presented. All cases of a type are analyzed graphically and boundary limits for forecasting fog or no fog drawn. Prediction of time of arrival or formation of fog and time of lifting, based on empirical rules supplementing standard rules for movement of fronts or troughs, outlined in detail. A radiation fog graph is included (by J. J. George.) (*Same abstract* as No. 3.2–49 in Feb. 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. Ypsilanti, Michigan. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–182 551.509.34:551.575

Saunders, W. E., **Method of forecasting the temperature of fog formation.** *Meteorological Magazine*, London, 79(938):213–219, Aug. **1950.** 4 figs., table. **MH-BH**—Examination of 48 cases of fog at Northolt, near London, showed that the temperature at which fog forms could be forecast within 1°F from the dew point curve on the radiosonde tephigram at 1500. Three types of hydrolapse are defined and procedures for forecasting set out. (*Same abstract* as No. 10–41 in Oct. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Fog forecasting 3. England.**—*C.E.P.B.*

3E–183 551.509.317:551.509.54

Schmidt, Reinhart C., **Forecasting occurrence of precipitation in Washington, D. C. area during June and July.** Washington, D. C., U. S. Weather Bureau Airport Station, May **1950.** map. **WB-AS**—The report is in current use as a forecast tool at Washington National Airport. It consists of a list of tentative rules which "can be used to considerable advantage in determining whether rainfall (or dry thunderstorms) will occur in northern Virginia during a 12-hour period, 7 a.m. to 7 p.m. tomorrow, based on upper air data available at time of 0130E today surface map." *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Rules of thumb 4. Washington, D. C. I. U. S. Weather Bureau.**

3E–184 551.509.317:551.509.54

Schmidt, Reinhart C., **Forecasting precipitation during August for Washington, D. C. area.** Washington, D. C., U. S. Weather Bureau Airport Station, July **1950.** 2 p. **WB-SRFD**—Outline of an objective procedure developed and tested on data for the months of August, 1947–48–49, and based on 850 and 700 mb charts. Cases are first classified on the basis of 700 mb height relationships among stations at Washington, Toledo, and Nashville. These are further subdivided according to various trajectory considerations. Practice forecast rating percentages for dependent data are near 84%. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C.**—*U. S. Weather Bureau abstracts.*

3E–185 551.509.317:551.509.58

Schroeder, Mark J., **Forecasting humidities along the north shore of Lake Superior.** U. S. Weather Bureau, Short Range Forecast Development Section, **1950.** 10 p. 3 figs., 2 tables. **WB-SRFD**—The study is aimed at determining "conditions under which lake shore humidity was significantly different from the inland humidity." Numerous correlations were attempted involving dew point, temperature, and geostrophic measurements at selected key stations with rather inconclusive results. "The correlation that showed the most promise was a plot on polar coordinate paper of the difference between the lake shore and inland relative humidities against the geostrophic wind direction and speed." Skill scores of .55 and .51 were obtained in tests on 1949 records when

the objective forecast aid was applied to the official inland humidity forecast. *Subject Headings.* **1. Objective forecasting 2. Fire weather forecasting 3. Northeast Minnesota. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–186 551.509.33

Serra, Adalberto, **Método gráfico de pronóstico.** [Graphic method of forecasting.] *Nimbus*, 2(6–7):37–40, April–Sept. **1950.** fig. **MH-BH**—A simple graphic method for extrapolation of records of temperature, pressure, sunspot numbers, zonal indexes, etc. where the periodicity is irregular. The mean time interval is ignored and the "forecast" curve (or time of maxima and minima) obtained by projecting the actual (smoothed) variations into the future. This method is probably as good as any. (*Same abstract* as No. 2.11–49 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Statistical forecasting 3. Extended forecasting 4. Periodicities 5. Graphical presentation.**—*M.R.*

3E–187 551.509.3:551.577

Showalter, A. K., **An approach to quantitative forecast of precipitation (III).** *American Meteorological Society. Bulletin*, 31(1):23–25, Jan. **1950.** 8 refs. **DWB**—Brief article suggesting revision of the author's quantitative precipitation formulas (*ibid.*, 25:137–142, 276–288, April and Sept. 1944), based on more recent work of Byers, Hull and Fletcher. (*Same abstract* as No. 4–28 in April 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting.**—*M.R.*

3E–188 551.509.317:551.515.4

Similä, Artturi, **En ny snoptisk-aerologisk metod att förutsäga åska.** [A new synoptic-aerological method for forecasting thunderstorms.] *Sweden, Meteorologiska och Hydrologiska Institut, Meddelanden, Ser. B*, No. 8, **1950.** 15 p. charts and graphs with English subtitles, refs. In Norwegian. **DWB**—Since instability in the free atmosphere determines the extent to which convective clouds can grow vertically and give rise to thunderstorms and since it changes slowly within an air mass, it is possible to determine and map areas of stability and instability. The use of the slice method for determining the temperature gradient within a cloud, the derivation of equations for calculating instability and probability of thunderstorms and the Rossi formula for determining relative humidity with an air layer are described. The application of these formulas for mapping thunderstorm probability over western Europe is shown in a series of maps. (*Same abstract* as No. 3.5–79 in May 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Rossi formula 4. Western Europe.**—*I.L.D.*

3E–189 551.509.31:551.578.1

Thompson, Jack Coats, **A numerical method for forecasting rainfall in the Los Angeles area.** *Monthly Weather Review*, 78(7):113–124, July **1950.** 9 figs. (incl. 2 synoptic charts), 8 tables, 16 refs., 3 equations. **MH-BH**—Scatter diagrams, with probability lines carefully drawn, are used to make objective forecasts of rainfall at Los Angeles. This method shows a slight edge over conventional methods. (*Same abstract* as No. 2.1–51 in Jan. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Los Angeles, California.**—*M.R.*

3E–190 551.509.52

§Thompson, Jack Coats, **Preliminary report on a method for forecasting wind velocity for short periods. A meteorological forecasting investigation for improving the prediction of airport acceptance rates.** *U. S. Weather Bureau, Technical Report* No. 2, Dec. 26, **1950. DWB**—From Newton's basic equations of motion a method for forecasting the wind velocity is derived. "The method involves the substitution of finite difference measurements for the space differentials in the equations of motion in order to compute the local instantaneous acceleration of the wind. This acceleration is assumed to remain constant for the period of the forecast, and an integration is performed to give velocity at a future time. An attempt is made to remedy deficiencies by evaluating the effect of friction on the surface wind." *Subject Headings:* **1. Objective forecasting 2. Wind forecasting 3. Washington, D. C. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–191 551.509.3:629.13

†*§U. S. Weather Bureau, Short Range Forecast Development Section, **A meteorological forecasting investigation for improving the prediction of airport acceptance rates.** *U. S. Weather Bureau, Progress Reports* Nos. 1–5, and Final Report Pts. I and II, April 1, **1950** to July 1, **1951.** 7 pieces. figs., tables, refs., equations, appends. **DWB**—An attempt is made to provide systematic objective methods for forecasting, 6 hours in advance, weather elements (ceiling, visibility, wind velocity, turbulence, and icing) which affect the rate of landing and take-off at an airport. Readers are referred to Progress Reports 1–3 of this series for outlines of the forecast methods devised for specific

weather elements. Part II of the Final Report is a detailed summary of the five progress reports and contains numerous figures, tables, and references. Forecast reliability by objective methods developed in this study has proved superior to that of conventional forecasts. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Washington, D. C. 4. San Francisco, California.**

3E–192 551.509.3:551.575:629.13

§Visscher, H. B., **Indianapolis OXO Weather.** Atlanta, Ga., Eastern Air Lines, Meteorological Dept., Sept. **1950.** 23 p. 5 figs., 3 tables, ref., append. **DWB**—Sets of rules were drawn up for forecasting "migratory stratus," pre-warm front stratus, post-cold front stratus, and radiation fog which resulted in sub-minimum ceilings or visibility (below 200 ft. or ½ mile). Special emphasis is laid on the forecasting of "migratory stratus," an area of fog or stratus which is prevalent from Texas to the Canadian border between the Rockies and the Appalachians and is associated with no warm front or with warm fronts of sharpness less than 90°. *Subject Headings:* **1. Objective forecasting 2. Visibility forecasting 3. Airways forecasting 4. Stratus cloud forecasting 5. Indianapolis, Indiana. I. Eastern Airlines, Inc. Meteorological Dept.**

3E–193 551.509.3:551.577

Williams, Philip, Jr., **An objective method of forecasting summer precipitation at Salt Lake City, Utah.** *Monthly Weather Review*, 78(8):148–152, Aug. **1950.** 2 figs., 4 tables, 8 refs. **DWB**—Data for July and August 1946 through 1949 were used to test the significance of numerous variables against probability of precipitation at Salt Lake City. A scatter diagram was prepared showing relation of the latter to surface dew point at Salt Lake City (1530MST); temperature-dew point spread at 2030MST between 700 and 500 mb at Las Vegas, Ely, Grand Junction, Boise or Lander (depending on 12,000 ft air flow). Independent check shows skill score slightly below that of staff making subjective forecasts. (*Same abstract* as No. 2.2–35 in Feb. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Salt Lake City, Utah.**

1951

3E–194 551.509.3

†Allen, Roger A. and Vernon, Edward M., **Objective weather forecasting.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 796–801. 29 refs.) **MH-BH**—The breadth of the field of objective forecasting is outlined, recent developments described and the deficiencies and unanswered questions which have arisen in such work indicated. Recommendations for future research and an excellent bibliography are included. *Subject Heading:* **1. Objective forecasting.**—*From author's abstract.*

3E–195 551.509.317:551.515.4

§Allyn, William J., **An objective method of forecasting summer thunderstorms on the Chelan Forest area.** Seattle, Tacoma Airport, Wash., U. S. Weather Bureau Airport Station, Fire Weather Service, June 6, **1951.** 10 p. 15 figs., 2 tables, refs. **DWB**—A method was developed for forecasting thunderstorms 6 to 30 hours in advance using data available at 1800 PST. Techniques used were similar to those used by CRAMER (*see item* 3E–123 above) LINDQUIST, and BEERS (*see item* 3E–154 above). Cases were classified as thunderstorm and no-thunderstorm days, and variables taken from the 1530 (1730 PST) raob reports, 2130Z (1330 PST) pibal reports and 1130Z (1630 PST) surface reports were tested by pairs on scattergrams to find the best combinations for objective forecasting. Definite improvement in forecast verification resulted when the objective method was used to supplement the subjective. *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Chelan Forest, Washington. I. U. S. Weather Bureau.**

3E–196 551.509.33

†Aubert, Eugene J., **The application of one-dimensional numerical methods to extended forecasting.** U. S. Weather Bureau, Extended Forecast Section, April **1951.** 27 p. 9 figs., 2 tables, 13 refs., 15 equations. **DWB**—An attempt is made to determine whether numerical forecasts using the one-dimensional barotropic model of CHARNEY and ELIASSEN could be used to prepare prognostic charts for up to four days in advance. Forecasts were made for North America and the Atlantic for twelve five-day mean winter cases for the 700 mb level and were compared with routine 5-day forecasts and found to show some skill, but not enough to use in routine 5-day forecasts. Techniques are outlined, formulas derived and illustrative charts included. (*Same item* as No. 2.11–43 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Mathematical forecasting 3. Extended forecasting. I. U. S. Weather Bureau. Extended Forecast Section.**—*M.R.*

3E–197 551.509.54

Battan, Louis J., **Summer rainfall in the New York City area.** U. S. Weather Bureau, Short Range Forecast Development Section, Feb. **1951.** 12 p. 11 figs., 2 tables, ref. Manuscript.

WB-SRFD—Assuming that rainfall occurrence in the subject area is dependent on moisture supply and vertical motion (measured on prognostic charts of sea level pressure distribution and the 700 mb contour field), the author devised an objective forecasting system. Certain combinations of the values of the chosen variables serve as criteria with which test cases may be compared to determine whether such cases indicate "rain" or "no rain" conditions. Tests made in the Weather Bureau, Short Range Forecast Development Section, showed skill scores ranging from .14 to .72. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. New York, N. Y. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–198 551.509.317:551.515.8

Bristor, Charles L., **Forecasting the passage of cold fronts at N. Y. C. 30-hrs in advance.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, Nov. **1951.** 7 p. 6 figs., ref. **WB-SRFD**—The problem of determining whether "the trough circulation will become sufficiently extensive and the system will move close enough so that present indicated southerly warm air trajectories will be altered in response to the cyclonic flow and transport cold air from the northwest into the after trough" is attacked objectively. A figure, on which 700 mb (cold frontal) trough development and acceleration are expressed as functions of the unbalance of indicated temperature advection, illustrates the degree of unbalance in the advective pattern at any point under consideration along the 700 mb cold frontal trough. In limited tests, the system showed good separation in the decision of frontal passage. It is thought that the system might also be used for forecasting advective temperature changes. *Subject Headings:* **1. Objective forecasting 2. Pressure forecasting 3. New York, N. Y. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–199 551.509.54

Bristor, Charles L. and Smith, Clarence D., **A quasi-objective system for forecasting the occurrence of summer precipitation of Lansing and Detroit.** U. S. Weather Bureau, Short Range Forecast Development Section, May **1951.** 11 p. 4 figs., 2 maps, illus. append. Manuscript. **WB-SRFD**—"The system developed is an attempt at objective expression of some of the more common arguments employed subjectively by forecasters." Emphasis is laid on the relation between precipitation and the presence of a cold-frontal trough upstream (*see item* 3E–198 above). Contingency tables, skill scores and percentages correct are included. "Acceleration and deceleration, deepening and filling of troughs and pressure centers, and local convective developments are represented in the system only indirectly if at all. Independent tests by the Short Range Forecast Development Section of the Weather Bureau show the method is worthy of further development. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Lansing, Michigan 4. Detroit, Michigan. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–200 551.509.317:551.509.54

§Carstensen, L. P. and Hardy, Albert, **Relation of precipitation to the pressure pattern in New York City area in winter.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, April, **1951.** 9 p. 7 figs., table, 3 refs. **WB-SRFD**—This paper is the first study on the objective use of surface and upper air prognostic charts in the direct forecasting of weather elements. It represents an attempt to "relate winter precipitation at New York City to factors directly determinable from the pressure pattern." Results were approximately equal to routine forecasts and will improve as prognostic charts more closely approach perfection. It is probable that this paper will serve as the keystone for further research along the same line. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. New York, N. Y. I. U. S. Weather Bureau. Short Range Forecast Development Section.**

3E–201 551.509.317:551.515.127:551.54

*§George, Joseph Johnson; Roche, Robert D.; Visscher, Hubert B.; Shafer, Robert J.; and Biggers, William R., **On the relationship between the fields of atmospheric pressure and temperature at upper levels and the behavior of surface pressure systems.** Atlanta, Eastern Air Lines, Inc., Meteorological Dept., Contract AF 19(122)-468, Report No. 2, Sept. 15, **1951.** 38 p. 18 figs., 3 tables, 6 refs. **DWB**—Parameters used for forecasting the speed of movement of certain classes of cyclones are "the location of the apparent center of warm air advection at 850 mb, the component of gradient wind above this point and the total thermal gradient north and west of the low center at several levels. Fairly satisfactory results were determined for direction of motion of these cyclones using variation of the same parameters." Deepening and filling and steering are also studied and discussed. Report No. 1, June 8, 1951 is mainly administrative. *Subject Headings:* **1. Objective forecasting 2. Cyclone movement forecasting 3. Steering. I. Contract AF 19(122)-468 II. Eastern Airlines, Inc., Meteorological Dept.**—*From author's abstract.*

3E–202 551.509.3:629.13

Goldman, Louis, **On forecasting ceiling lowering during continuous rain.** *Monthly Weather Review*, 79(7):133–142, July **1951.** 9 figs., 4 tables, 7 refs., 12 equations. **DWB**—The rate of moisture change (increase due to evaporation from falling raindrops) is combined with the effect of other factors in order to obtain a formula which may be applied to find the time a ceiling of given height will occur. The variables in the forecast formula are: 1) the wet bulb temperature depression measured from the start of rain and 2) the effective rate of moisture increase (found empirically) caused by factors other than evaporation. An approximate method, based on the surface value of the depression, is used for finding the time of occurrence of the 800-, 500-, and 300-foot ceilings. This approximate method appears to be best suited for forecasting the 500-foot ceiling. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting.**—*From author's abstract.*

3E–203 551.509.3:629.13

Hamon, W. Russell, **Remarks concerning the usefulness of ceiling probabilities as furnished by the New Orleans tabulation unit.** Washington, D. C., U. S. Weather Bureau Airport Station, Oct. **1951.** 2 p. 2 figs., tables. **WB-AS**—Ceiling probabilities based on surface wind direction and ceiling at 1930E the previous evening were compared with official airway forecasts and skill scores obtained. For both ceilings of 1000 ft or less or 2000 ft or less, the airway forecasts were superior. To improve this poor skill score, the author suggests the introduction of new parameters. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Probability forecasting. I. U. S. Weather Bureau.**

3E–204 551.509.34:551.524

Hardy, Albert V., **Forecasting the weather—An objective method for forecasting minimum temperature at New York City.** *Weatherwise*, 4(2):42–45, April **1951.** 2 figs., table. **MH-BH**—A description of the method developed by Woodrow W. Dickey (*see item* 3E–129 above) for forecasting minimum temperature at Philadelphia. The method is based upon a network of sea-level pressure readings designed to provide an objective estimate of the source of air expected over the station at the time of the minimum. The forecasting equations and results are given. (*Same abstract* as No. 2.11–50 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. New York, N. Y.**—*I. L. D.*

3E–205 551.509.5

§Harrison, Henry T., **Results of synoptic tests applied to certain forecasting rules.** *American Meteorological Society, Bulletin*, 32(3):89–96, March **1951.** 8 figs., 9 tables, 6 refs. **MH-BH**—One of the best practical forecast studies produced in the last 35 years. Twenty-five forecast rules tested for accuracy and results, based on a score or more of cases for each, are listed. For nine of the rules the results were good enough (78%) to warrant use. Synoptic examples are given in addition to verification (or confidence) score for each. The remaining 16 are divided into two categories, 7 listed as "inconclusive" and 9 as doubtful. The latter cases were no more useful than tossing a coin would be. The verification (100%) was for steering of cyclones (based on 10,000 ft flow) in the Eastern United States. (*Same abstract* as No. 2.10–50 in Oct. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Forecast verification 3. Eastern United States.**—*M. R.*

3E–206 551.509.3:629.13

Hoover, Robert A., **Forecasting advection stratus during spring at Washington, D. C.** Washington, D. C., U. S. Weather Bureau Airport Station, March **1951.** 6 p. 2 tables, ref. **WB-AS**—Principal variables found useful in forecasting advection stratus at Washington, D. C. were 1600E 1000 ft wind at Washington, D. C. and the difference between the temperature and dew point at sunset up wind along the coast. A direct relationship was found between veering winds and non-veering winds with elevation and advection stratus formation. Results of a test on 1949 and 1950 data are tabulated. *Subject Headings:* **1. Objective forecasting 2. Stratus cloud forecasting 3. Airways forecasting 4. Washington, D. C. I. U. S. Weather Bureau.**—*From author's abstract.*

3E–207 551.509.3:551.575:629.13

Hoover, Robert A., **Forecasting the duration of low clouds following cold front passage at Elkins, West Virginia.** *Weatherwise*, 4(3):62–63, June **1951. MH-BH**—An investigation was carried out to find some systematic indices of the duration of low, post cold-frontal cloudiness over the Appalachian Range. The only satisfactory variable was found to be the orientation and number of 3-millibar isobars between Elkins and the ridge of high pressure back of the cold front as the front passed Elkins. Tests showed an average error of eight hours. (*Same item* as No. 3.1–60 in Jan. 1952 *Meteorological Abstracts*). *Subject Headings:* **1. Objective forecasting 2. Cloud forecasting 3. Airways forecasting 4. Elkins, West Virginia.**

3E–208 551.509.3:551.575:629.13

Horton, F. L., [**Graphs for forecasting fog or stratus at Norfolk, Va.**] Washington, D. C., U. S. Weather Bureau Airport Station, **1951.** 2 graphs. **WB-AS**—Dew point at 1930E and 2000 ft wind speed and direction at 1700E are used as ordinates for scatter diagrams from which probability of fog or stratus can subsequently be read. Cases with rain, stratus, or fog at 1930E are omitted. *Subject Headings:* **1. Objective forecasting 2. Airways forecasting 3. Stratus cloud forecasting 4. Norfolk, Virginia. I. U. S. Weather Bureau.**

3E–209 551.509.54

Hunter, Marvin N., **Katallobaric centers and the subsequent occurrence of precipitation at Washington, D. C.** *American Meteorological Society Bulletin*, 32(10):363–370, Dec. **1951.** charts, tables, refs. **MH-BH**—An investigation was undertaken to determine quantitatively the "frequency with which rain has occurred in the past within a specified time and at a particular place following the observation of a particular type of isallobaric configuration." This report is unique in that it points out the relation of one variable, pressure change, to several weather elements instead of several variables to one element. HUNTER selects his one variable and searches for uses to which it can profitably be put rather than selecting the desired weather element and hunting for variables which will facilitate its forecasting. A seven months' test of his objective precipitation forecasts using pressure change as the parameter shows favorable results. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C.**

3E–210 551.509.34:551.577

Laird, Harley B., **Forecasting precipitation on the west slope of Colorado.** *Monthly Weather Review*, 79(1):1–7, Jan. **1951.** 9 figs., 2 tables, 6 refs. **DWB**—Data for spring months (March, April and May) of 1947 and 1948 were used to develop scattergrams for objective criteria and data for 1949 used as independent check. Eleven variables were tested for each of five synoptic precipitation types, and those which proved significant were used in the final combined correlation diagram. These were pressure gradients to west of Colorado, distance of fronts and 700 mb relative humidity—mainly for Grand Junctions. (*Same abstract* as No. 2.10–48 in Oct. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Colorado.**—*M.R.*

3E–211 551.509.317:551.509.54

Libuit, Modesto O., Jr., **On the objective method of forecasting rain for Manila.** *The Elements*, Manila, 2(6):5–6, June **1951.** **DWB**—An objective method for May–Oct. is developed from 1948–1950 data. Method is based on 2000 ft MSL wind, average relative humidity of the 800–500 mb layer, and recorded 24-hour rainfall. Results are still in the process of testing in the Philippines. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Manila, Philippines.**

3E–212 519.241.2:551.509

Ogawara, M., Ozawa, T. and Tomatsu, K., **Diagrams of confidence limits of occurrence probability.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 29(6):181–193, June **1951.** fig., tables, 13 refs., equations. In Japanese, English summary p. 193. **MH-BH**—Given k occurrences of an event in N trials, the upper and lower limits of probability of occurrence in any given trial are calculated for confidence limited of 90 and 98%. These are shown in tables and diagrams. The application to statistical forecasting is discussed. (*Same abstract* as No. 3.3–33 in March 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Probability forecasting 3. Statistical forecasting.**—*C.E.P.B.*

3E–213 551.509.54

Palmer, Wayne St. Clair, **On summer precipitation forecasting in southwestern Ohio.** Washington, D. C., U. S. Weather Bureau, May **1951.** 14 p. chart, ref. Fold. work sheet. **DWB**—The method described is a semi-objective one in which the forecaster enters the answers to a series of questions (on pressure gradient and distribution, frontal pattern, and dew point) on a work sheet to determine the probability of precipitation for the Cincinnati area. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Probability forecasting 4. Cincinnati, Ohio. I. U. S. Weather Bureau.**

3E–214 551.509.317:551.509.53

§Rampey, Ernest M., **An objective aid in forecasting winter minimum temperature at Nashville, Tennessee, based on the 0130E map.** Washington, D. C., U. S. Weather Bureau Airport Station, March **1951.** 5 p. 26 figs., 2 tables, 3 refs., 2 appends. **WB-AS**—It was hoped that the temperature-pressure grid used by DICKEY (*see item* 3E–129 above) for forecasting minimum temperature in Philadelphia could be applied to Nashville through a shift of constants and coordinates. In this

case, however, it was found necessary to apply correction factors based on upper air patterns in an attempt to introduce the "elements of speed, development, and acceleration into the otherwise static picture" presented by the grid. When tested on independent data, the objective method showed results superior to the conventional forecast. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Nashville, Tennessee. I. U. S. Weather Bureau.**

3E–215 551.509.317:551.509.54

Rampey, Ernest M., **An objective method of forecasting winter precipitation two days in advance for Nashville, Tenn.** Washington, D. C., U. S. Weather Bureau Airport Station, **1951.** 12 p. Manuscript. **WB-AS**—Although the forecast rules for Washington did not prove sufficiently accurate for use in Nashville, the method used by R. C. SCHMIDT (*see item* 3E–221 below) to arrive at the Washington rules was applied in devising similar rules for Nashville. After determining the main moisture sources, the problem became to isolate the conditions which would tend to change the normal circulation in such way as to allow the transport of large quantities of moisture from the source region. Flow patterns were grouped according to the height of the 850 mb surface at selected stations and the surface pressure gradient. Forecast rules for each type and instructions for their use are included. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Nashville, Tennessee. I. U. S. Weather Bureau.**

3E–216 551.509.53

Randall, Ray F., **A practical method of determining minimum temperatures at the Salt Lake airport, May through September.** Salt Lake City, Utah, U. S. Weather Bureau, Airport Station, Feb. 20, **1951.** 5 p. 2 figs., table, 2 refs. Manuscript. **DWB**—The important elements cited by ELLISON (*see item* 3E–27 above) as basic to a minimum temperature formula are summarized. A formula similar to YOUNG's is developed for the subject area because radiation is considered the primary factor in this case also. One formula was found sufficient for all months. Accuracy of the formula was improved by adding a correction for relative humidity. When tested on 1949 summer data, the formula showed an average error of 2.2 degrees as compared with a 2.8 degree average error by conventional methods. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Salt Lake City, Utah. I. U. S. Weather Bureau.**

3E–217 551.509.53

Reuter, Heinz, **Forecasting minimum temperatures.** *Tellus*, 3(3):141–147, Aug. **1951.** 3 figs., 2 tables, 18 refs., equations. **MH-BH**—The theory of nocturnal cooling of the earth's surface is reviewed and BRUNT's well-known formula stated. For the practical application of the cooling formula, a diagram is constructed. A test of the results using observations for Vienna shows a good agreement between the predicted and observed temperature minima. *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. Nocturnal cooling 4. Vienna, Austria.**

3E–218 551.509.3:551.513

†§Riehl, Herbert, Badner, J., Hovde, J. E. and others, **Forecasting in middle latitudes.** Chicago, University, Dept. of Meteorology, March **1951.** 168 p. 65 figs., 3 tables, 77 refs., equations. **DWB, MH-BH**—Actual rules for construction of surface and upper air prognostic charts, with sufficient theory and many empirical rules or suggestions, make this one of the few such works to appear in the last 40 years. Three actual series are analyzed and discussed, prognostic charts drawn and a "post mortem" given. Nomograms and tables are given in appendix. (*Same item* as No. 2.11 39 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Rules of thumb 3. Synoptic forecasting 4. Textbooks 5. Chicago, Illinois.**—*M.R.*

3E–219 551.509.317:551.509.54:629.13

Schmidt, Reinhart C., **June precip forecasting (short range) for Pittsburgh, Pa., airport.** Washington, D. C., U. S. Weather Bureau Airport Station, **1951.** 1 p. **WB-AS**—A series of forecast rules based on 700 and 850 mb pressure and pressure tendency at selected stations as recorded on the 2200E constant pressure charts is presented. The rules cannot be applied successfully when certain indicated patterns of closed low circulation exist at 850 or 700 mb. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Airways forecasting 4. Pittsburgh, Pennsylvania. I. U. S. Weather Bureau.**

3E–220 551.509.33:551.577

Schmidt, Reinhart C., **A method of forecasting occurrence of winter precipitation two days in advance.** *Monthly Weather Review*, 79(5):81–95, May **1951.** 7 figs., 9 tables, 10 refs. **DWB**—Starting with the novel hypothesis that no winter precipitation will occur in the Washington, D. C.–Baltimore area unless sufficient moisture flows into the area aloft (and vice versa), a single parameter

system of forecasting for 48 hours in advance was tested, giving scores of 86% compared with 68% for official forecasts made at Washington National Airport. The single parameter used was the trajectory of air reaching Nashville, Tenn. at 850 mb level. If the flow was essentially from the NW or SE, *no rain*, and if from the SSW or S, *rain* was forecast. To further improve the skill score, certain other parameters were introduced, based on 700 and 850 mb flow at Atlanta, Ely, Grand Junction, etc as well as Nashville, Oklahoma City and Little Rock. Independent data were used to verify accuracy and a test made in Jan. 1951, using rules promulgated. (*Same abstract* as No. 3.3-68 in March 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C.**—*M.R.*

3E–221 551.509.317:551.509.54

§Schmidt, Reinhart C., **A method of forecasting precipitation 28-40 hours in advance during October.** *Monthly Weather Review*, 79(6):116–124, June **1951.** 13 figs., 4 tables, 2 refs. **DWB**—Maps were typed according to flow patterns aloft and all possible variables (taken from the previous day's upper air charts) were tested, especially for those cases where no rain occurred. By a successive method of eliminating cases where rain was expected by old empirical rules but did not occur, a number of new rules were worked out and applied in 1950, with a 90% "correct" verification and skill score of 0.62 proving that synoptic study and use of upper air data can markedly improve forecasts for 36 hours ahead. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting.**—*M.R.*

3E–222 551.509.34:551.524

Schwerdtfeger, Werner, **Bases para el pronóstico a medio plazo de las condiciones de temperatura en el otoño de Buenos Aires.** [Bases for medium range forecasting of temperature conditions in autumn at Buenos Aires.] *Meteoros*, Buenos Aires, 1(1):33–45, Jan. **1951.** 5 tables, refs. Spanish and English summaries, p. 33. Abstracted from reprint. **DWB**—The author indicates a need for statistical forecasting methods to compensate for the limitations of synoptic forecasting due to inadequate observational coverage of the South Pacific. A multiple correlation method for forecasting mean daily temperature is presented which uses three independent variables: 1) deviation of temperature from normal, 2) pressure difference between Buenos Aires (35°S) and Santa Cruz, and 3) interdiurnal pressure variation at Buenos Aires. The method was shown to be useful in forecasts made during 1949 by personnel of the Argentine Meteorological Service. The author points out that his technique can still be improved by introducing other parameters. (*Same abstract* as No. 2.9-46 in Sept. 1951 and 3C-230 in March 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Extended forecasting 3. Temperature forecasting 4. Argentina.**—*R.S.Q.*

3E–223 551.509.3:517

Sutton, O. G., **Mathematics and the future of meteorology.** *Weather*, 6(10):291–296, Oct. **1951.** fig. **DWB**—A philosophical discussion which arrives at the conclusion that indeterminacy due to the prevailing instability in the atmosphere will prevent accurate weather prediction by mathematical methods more than a few days ahead. (*Same abstract* as No. 3.3-60 in March 1952 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Mathematical forecasting.** —*C.E.P.B.*

3E–224 551.509.3:551.515.4

Tillotson, Kenneth C., **An objective aid for forecasting September thunderstorms at Denver, Colo.** *Monthly Weather Review*, 79(2):27–34, Feb. **1951.** 6 figs., 12 tables, 6 refs. **DWB**—A general discussion of thunderstorms in the Denver area is followed by a statistical analysis of the occurrence (diurnal and monthly) and persistence of thunderstorms in that region, the mechanism of thunderstorm formation, effect of orography, etc. The variables analyzed in constructing an objective formula were: winds in the free air, 700 mb flow, mixing ratio, pressure lapse between condensation and freezing level and moist instability. The three most successful variables were combined and results tested with 85% of 60 correct, compared to 75% correct for official forecasts. (*Same abstract* as No. 2.11-40 in Nov. 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Thunderstorm forecasting 3. Denver, Colorado.**—*M.R.*

3E–225 551.509.317:551.576

U. S. Air Weather Service, **The cirrus-forecasting problem.** *U. S. Air Weather Service, Technical Report* No. 105-81, Nov. **1951.** 11 p. illus., refs. **DWB**—The empirical knowledge that a "positive correlation exists between cirrus occurrence and simultaneous veering with height (warm air advection) of the geostrophic wind between 700 and 300 mb" is used in an objective system of estimating whether or not a "cirrus-favorable mechanism" will occur. The method, in which wind shear is determined by superimposing the 300 mb chart on the 700 mb chart, is only a forecast aid

which must be supplemented by considerations of humidity and subjective interpretation of the synoptic situation. *Subject Headings:* **1. Objective forecasting 2. Cloud forecasting 3. Cirrus clouds.**

3E–226 551.509.3:512

Wadsworth, George P., **Application of statistical methods of weather forecasting.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 849–855. fig., 17 refs.) **DWB**—Discusses the philosophy of the statistical approach, emphasizing the need for a physical (dynamic) background. Prediction of time series is examined, the problem being to isolate the dynamics from random or unknown factors by generalized harmonic analysis, but the spectrum of short oscillations varies from year to year. Prediction is not much improved by using groups of stations because errors are due to new factors over large areas. These considerations are applied to analogs. The parameters should be hemispheric, e.g. general flow; sea temperatures are also important. Progress requires cooperation of meteorologists and statisticians. *Subject Headings:* **1. Mathematical forecasting 2. Statistical techniques.**—*C.E.P.B.*

3E–227 551.509.54:629.13

§Weaver, Robert L., **An objective study in forecasting duration and amount of precipitation at San Francisco airport.** San Bruno, Calif., U. S. Weather Bureau, Jan. **1951.** 9 p. fig., 11 graphs, table. **DWB**—The study is aimed at providing a simple objective tool to aid in determining the duration of an imminent rainy period and in estimating probable amounts. Therefore cases studied and classified were limited to those winter situations where rain was highly probable. Pressures at and between selected stations located in northern California and westward about 800 miles to the 140th meridian were the only variables used. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Airways forecasting 4. San Francisco, California. I. U. S. Weather Bureau.**

3E–228 551.509.317:551.509.54

Wynn, Harry L., **July rain forecast system for Pittsburgh. August rain forecast system for Pittsburgh.** Pittsburgh, Pa., U. S. Weather Bureau Airport Station, **1951.** 3 p. **WB-AS**—A series of rules regarding 850 and 700 mb pressure distribution are drawn up as guides to the objective forecasting of precipitation for Pittsburgh. Tests on July 1951 data were not as successful as had been hoped so the rules were revised for August. The system then showed an accuracy of 91.9% in describing August weather. It appears, however, that the method is based on only one month of data. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Pittsburgh, Pennsylvania. I. U. S. Weather Bureau.**

3E–229 551.509.31:551.509.317:551.509.5

Wynn, Harry L., **An objective method of typing flow patterns at the 700 mb level.** Pittsburgh, Pa., U. S. Weather Bureau Airport Station, **1951.** 1 p. table. **WB-AS**—A method of classifying flow patterns into eight types by points of the compass was devised as a basis for precipitation forecast schemes. Such a basic classification of flow pattern could also be used to arrive at a number of climatological frequencies useful in the objective forecasting of various weather elements. *Subject Headings:* **1. Objective forecasting 2. Objective weather map classification 3. Winds aloft forecasting 4. Pittsburgh, Pennsylvania. I. U. S. Weather Bureau.**

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3E–230 551.509.317:551.509.532

Johnson, Charles B., **Favorable spring frost conditions in the middle Atlantic states.** *Weatherwise,* 5(2):38–40, April **1952.** 3 figs., 4 tables, 3 refs. Manuscript. **MH-BH**—"The purpose of this study was to show the general weather conditions associated with frost in the fruit growing areas of Virginia, western Maryland and eastern West Virginia during spring. Data were tabulated to show the frequency of frost mornings, the duration of frost periods, the wind speed at sunrise, and the temperatures on frost mornings." A list of frost criteria was drawn up by the author and tested with good results at the Washington National Airport. *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Eastern United States.**

3E–231 551.509.317:551:515.8

Mook, Conrad Payne, **A test of Schmidt's method of forecasting the passage of southward moving cold fronts.** *Monthly Weather Review,* 80(2):19, Feb. **1952.** table. **DWB**—Seven cases were chosen from the summer 0130E maps, 1945–46, for an independent testing of SCHMIDT's (*see item* 3E–232 below) method. Forecast verification was excellent for the particular synoptic situation studied. *Subject Headings:* **1. Objective forecasting 2. Forecasting frontal movements 3. Forecast verification 4. Washington, D. C.**

3E–232 551.509.317:551.5158

Schmidt, Reinhart C., **Forecasting the passage of southward moving cold fronts in summer at Washington, D. C. 24–42 hours in advance.** *Monthly Weather Review*, 80(2):15–19, Feb. 1952. 4 figs., table, 3 refs. **DWB**—The study was undertaken with the hope of isolating the "criteria for the passage of the cold front" and thereby eliminating the necessity of prognosticating the pressure pattern. Temperature, pressure, and flow values at the 700 mb level at selected stations were chosen as parameters which would best describe the availability of the cold air in Canada and its subsequent movement. Scatter diagrams were used to indicate the correlation between the chosen parameters and cold front passage at Washington. *Subject Headings:* **1. Objective forecasting 2. Cyclone movement forecasting 3. Washington, D. C.**

3E–233 551.509.515.4

Schmidt, Reinhart C., **An objective method of forecasting precipitation at Washington, D. C., during the month of May.** To be published in: *American Meteorological Society Bulletin*, 1952. 10 p. chart, tables, 2 refs., 2 equations. **DWB**—Flow at the 700 mb and 850 mb levels was first analyzed and those situations singled out in which precipitation was impossible due to northwesterly flow or a defined ridge condition. Next the vertical temperature lapse rates over an area south and southwest of Washington were analyzed and the stability index (obtained by combining the temperature differences in degrees centigrade between the 850 mb and 700 mb constant pressure surfaces at Nashville and Greensboro) tested. A forecast table was constructed based on the idea that "the weaker the lapse rate the stronger the southerly flow necessary to produce precipitation and vice versa. In addition to this table a rule was inserted to eliminate rain in certain situations with insufficient moisture" and provision was made not to apply the forecast system if a "closed low" circulation (in turn determined objectively) existed in certain spots. Tests on May 1946–50 data showed better results than the official forecast. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Washington, D. C.**

SUPPLEMENTARY MATERIAL

3E–234 551.509.532

Karapiperis, Photios P., **Predicting minimum temperature, especially frost, by the evening wet-bulb at Blue Hill, Mass. in spring.** (In his: **Scientific Papers, 1950–1951.** 7 p. 6 figs., table, 13 refs. Manuscript.) **MH-BH**—Observations of ten Aprils (1941–50) at Blue Hill have been analyzed, and it has been found that frost (T) can be predicted on the basis of the 1900 h wet-bulb temperature (ti) by the formula: $T = ti - k$, in which k is found to be 1.8°F in clear weather and 2.1°F in cloudy. The results of a test on an independent set of Aprils (1936–40) are satisfactory, especially with clear skies at 1900. *Subject Headings:* **1. Objective forecasting 2. Temperature forecasting 3. Frost forecasting 4. Blue Hill, Massachusetts.**—*Author's abstract.*

3E–235 551.509.312

Defant, F., **A kinematic-graphical method for the 24-hour prognosis of the 500-mb chart.** Unpublished. Abstract in: *American Meteorological Society, Bulletin*, 33(2):83, Feb. **1952. DWB**—This report presents an organized extrapolation method useful as a tool in short range forecasting. "A quantitative technique for the 24-hour prognosis using kinematic principles with graphical methods is described with aid of eight models. An example of an actual forecast made is added." *Subject Headings:* **1. Objective forecasting 2. Upper air pressure 3. Short range forecasting.**

3E–236 551.509.3:551.515.13

George, Joseph Johnson, **The prediction of cyclogenesis.** Unpublished. Abstract in: *American Meteorological Society, Bulletin*, 33(2):83, Feb. **1952. MH-BH**—A method is described for predicting cyclogenesis 18 hours in advance of the formation of the first closed isobar, based upon thermal and wind patterns aloft. Accuracy appears to be unusually good although conclusive figures are not yet available. The method includes a means of predicting the subsequent intensity of the new storm as well as its 24-hour path and speed following its birth. Examples of how the method would have worked in the case of well-known storms are shown. *Subject Headings:* **1. Objective forecasting 2. Cyclogenesis 3. Cyclone movement.**—*Author's abstract.*

3E–237 551.509.312

Riehl, Herbert and Jenista, C. O., **A quantitative method for 24-hour jet stream prognosis.** Unpublished. Abstract in: *American Meteorological Society, Bulletin*, 33(2):83, Feb. **1952. MH-BH**—"A formula for the rate of propagation of isotachs on a constant pressure surface is derived and a computational routine, developed during a period of experimental forecasts, described. The verification of the 24-hour forecasts made to date is described." *Subject Headings:* **1. Objective forecasting 2. Jet stream forecasting.**

3E–238 551.509.54

Riehl, Herbert, Norquest, Kenneth S. and Subb, A. L., **A quantitative method for the prediction of rainfall patterns.** 17 p. 5 figs., 11 refs. As yet unpublished. Abstract in: *American Meteorological Society, Bulletin*, 33(2):83, Feb. **1952. MH-BH**—"Under certain assumptions, the vertical motion in the low and middle troposphere is directed upward in regions where the relative vorticity decreased downstream along the streamlines at 300 mb, and conversely. Computations covering sixteen observed charts show in general that at least some rainfall reaches the ground where upward motion should be present following the above. Fourteen charts giving actual 24-hour predictions show that this approach can be used to aid in the forecasting of precipitation patterns." *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting.**

3E–239 551.509.3:551.515.13

Shafer, Robert J., **A method of forecasting speed and direction of cyclones.** Unpublished. Abstract in: *American Meteorological Society, Bulletin*, 33(2):83, Feb. **1952. MH-BH**—Methods for computing in an objective manner the speed and direction of 30-hour movement of cyclones under southwest flow aloft are described. Parameters used include the center of apparent warm air advection of 850 mb, the component of wind along the lines connecting this point and the surface pressure center at both 850 mb and 700 mb and the isotherm gradient in the northwest quadrant of the 850, 700 and 500 mb levels taken from the surface low center. *Subject Headings:* **1. Objective forecasting 2. Cyclone movement.**—*Author's abstract.*

3E–240 551.509.59:551.515.3

*Shuman, Frederick G. and Carstensen, L. P., **A preliminary tornado forecasting system for Kansas and Nebraska.** Washington, D. C., U. S. Weather Bureau, Short Range Forecast Development Section, **1952.** 12 p. 2 figs., 7 charts, 3 refs., append. **WB-SRFD**—Realizing the vital necessity of a very high degree of accuracy in tornado forecasting, the authors devised an objective method of classifying days in advance as "certain tornado," "uncertain," and "certain non-tornado." Synoptic conditions associated with tornadoes were listed and four variables selected from the many "tried as indicators of the synoptic conditions." Variables chosen included measures of surface dew point, 700 mb temperature advection, and difference between 500 mb and surface temperatures at selected stations determined by objective criteria. When tested on dependent data, the system "yielded, with a high degree of accuracy, forecasts of no tornadoes on about 60% of all spring days and indicated in advance a group of days (including about ½ of all tornado days) on which forecasts of tornadoes will verify fairly well." *Subject Headings:* **1. Objective forecasting 2. Tornado forecasting 3. Kansas 4. Nebraska.**

3E–241 551.515.1:551.577

Zenone, E., **L'influenza de ciclone de Genova sul tempo del Canton Ticino.** [Influence of the Genoa cyclone on the weather of the Ticino Canton.] *Geofisica Pura e Applicata*, 21:32–38, **1952.** 4 tables, refs. English, German and Italian summaries p. 32. **MH-BH**—The approximately 30 cyclones which form annually in the Gulf of Genoa and influence the weather of the Ticino Canton are classified by criteria of frontal orientation and analyzed in connection with their effectiveness in producing precipitation at Locarno-Monti during the current, preceding and subsequent 24-hour periods. Tabulated observations included of the degree of actual relationship between particular frontal systems and precipitation might well serve as the basis for an objective forecasting system. *Subject Headings:* **1. Objective forecasting 2. Synoptic analysis 3. Precipitation 4. Italy 5. Switzerland.**

3E–242 551.584:551.579.42:63:551.524.371

†*Kessler, Otto Wilhelm and Kaempfert, Wolfgang, **Die Frostschädenverhütung.** [Protection against frost damage.] *Germany, Reichsamt für Wetterdienst, Wissenschaftliche Abhandlungen*, 6(2), **1940.** 243 p. 9 tables, 215 figs., 431 refs. **DWB**—Chapter II, p. 23–41, is an excellent review of the various frost forecast methods, most of which are fairly objective. Methods based on air temperature alone, on air temperature and humidity, and on dynamic change are discussed with reference to the important contributors to each field. An extensive bibliography (p. 236–243) contains numerous references to frost forecasting. *Subject Headings:* **1. Objective forecasting 2. Frost forecasting.**

3E–243 551.5(02)

*Belinskii, V. A., **Dinamicheskaia meteorologiia.** [Dynamic meteorology.] Moscow, OGIZ, **1948.** 703 p. 162 figs., 57+tables, 40 refs., numerous equations, 23 appends. **DLC**—In Chapter XX of this monumental textbook on dynamic meteorology is a complete exposition of the theoretical method of forecasting devised by I. A. Kibel' (1940). This numerical system is based on an integration of the equations of motion and attempts to utilize all surface and aerological data for a

single station or a limited area to obtain (for the next day) the pressure change and the wind, from the pressure and temperature fields from the surface to the tropopause boundary layers. The first approximation is developed in detail and the method for computing it graphically shown. In Chapter XXI, §5, an objective method of predicting diurnal temperature changes from radiative heat exchange equations (method of M. E. SHVETS, 1943) is presented and in §6 the modification of air masses under the influence of the underlying surface is considered in great detail. (*Same item* as No. 2.6-7 in June 1951 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Numerical forecasting.**—*M.R.*

3E–244 551.509.319:551.551:551.515:629.13

*§Whiting, R. M., **A method of forecasting the degree of turbulence in fronts and line squalls.** Atlanta, Ga., Eastern Airlines Inc., Meteorological Dept., **1948.** 22 p. 11 figs., tables, 6 refs., 4 equations. **DWB**—A catalog of some 300 reports of turbulence encountered in flights over the eastern part of the U. S. during 1947 and 1948, divided according to cases 10,000 ft or below and cases above 10,000 ft, is appended to an analysis and evaluation of the reporting and forecasting of turbulence degree (light, moderate and severe) or occurrence. Several bases are suggested, including the use of lapse rates. Two types of synoptic situations are recognized as important; cold front and line squall. The impact factor (expression for lifting force of a cold front) was found to be the best forecast tool, giving verification of 76% below and 84% above 10,000 ft. (*Same item* as No. H–192 in Aug. 1950 *Meteorological Abstracts.*) *Subject Headings:* **1. Objective forecasting 2. Turbulence forecasting 3. Line squalls 4. Fronts 5. Aeronautical meteorology. I. Eastern Airlines, Inc. Meteorological Dept.**—*M.R.*

3E–245 551.509.54

Vernon, Edward M. and Stoneback, M. E., **A numerical approach to rainfall forecasting for San Francisco.** Abstract in: *American Meteorological Society, Bulletin,* 33(3):127, March **1952. DWB**—Paper delivered at the American Meteorological Society 116th National Meeting, June 16–18, 1952, Corvallis, Oregon. Using BRIER's graphical method, multiple serial correlations are made between parameters taken from the synoptic maps (typed according to the steering principle followed by VERNON) and the occurrence or non-occurrence of rain at San Francisco with a time lag of 20 to 44 hours. Forecasts are expressed in terms of probability. The system is tested on independent data, its advantages and disadvantages discussed and improvements suggested. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. San Francisco, California.**—*From author's abstract.*

It will be noted that a large number of the studies on objective forecasting are unpublished manuscripts for local use. Consequently we have included many more papers dealing with the United States than with other regions, since the former are readily obtainable and the latter are not. We would appreciate having our attention called to similar studies which are available elsewhere, so that they can be included in future issues.

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only, and will not be listed on either the author or subject indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

Alaskan Science Conference, Washington, D. C., 1950, Proceedings, 1951.

Joesting, Henry R.: **Geophysics. Introduction,** p. 67–69.
Roberts, Elliott B. and Knapp, David G.: **Geomagnetism,** p. 69–70.
McNish, A. G.: **Interest of Central Radio Propagation Laboratory, National Bureau of Standards, in Radio Propagation Research in Alaska,** p. 70–71.
Swartz, Joel H.: **Geophysical investigations in the Aleutian Islands,** p. 71–72.
McCarthy, Gerald R.: **Geothermal studies in Northern Alaska,** p. 72–73.
Myers, W. H.: **Geophysical prospecting for oil through permafrost,** p. 73–74.
Wilson, William S.: **The program of the geophysical institute at the University of Alaska,** p. 74.
Spilhaus, Athelstan F.: **Meteorology. Introduction,** p. 74–75.
Dorsey, Herbert G., Jr.: **Meteorological factors affecting Alaskan development,** p. 75.
MacDonald, T. H.: **Measurement of solar radiation in the Arctic,** p. 75–76.
Oliver, Vincent J.: **Ice fog in interior Alaska,** p. 76.
Court, Arnold: **Climate, insects, and man in Alaska,** p. 76.
Bensin, Basil M.: **Agroclimatological investigations in the permafrost region of the Tanana Valley, Alaska,** p. 76–77.
Haynes, B. C.: **The weather Bureau's arctic observation program outside of Alaska,** p. 77–78.
Pettersen, Sverre: **On the maintenance of the Aleutian low,** p. 78.
Wickham, J. B.: **Flux of latent and sensible heat at the sea surface off Point Barrow, Alaska,** p. 81–82.
Thompson, Thomas G. and Barnes, Clifford A.: **Physical and chemical oceanography of the Gulf of Alaska and the Aleutian Islands,** p. 82.
Marmer, H. A.: **Tides and sea level in Alaskan waters,** p. 83.
Irving, Laurence: **A study of climatic adaptation in Arctic and tropical mammals and birds,** p. 85–86.
Carlson, Loren D.: **Acclimatization to the gold—physiological mechanisms,** p. 89.
Alter, Amos J.: **Water-supply problems in low-temperature areas,** p. 94–95.

American Geophysical Union, Transactions, Volume 33, Number 2, April 1952.

Marble, John Putnam: **Symposium on the measurement of geologic time. Introduction to the symposium,** p. 149.
McCrady, Edward: **The use of lead isotope ratios in estimating the age of the earth,** p. 156–170.
Roberts, Frank H. H., Jr.: **Carbon-14 dates and archeology,** p. 170–174.
Hurley, Patrick M.: **Alpha ionization damage as a cause of low helium ratios,** p. 174–183.
Kulp, Laurence J., Tryon, Lansing E., and Feely, Herbert W.: **Techniques of natural carbon-14 determination,** p. 183–192.
Ahrens, L. H.: **The oldest rocks,** p. 193–195.
Wilson, Tuzo J.: **Some consideration regarding geochronology with special reference to pre-cambrian time,** p. 195–203.
Decker, Wayne L.: **Hail-damage frequency distributions for Iowa, and a method of evaluating the probability of a specified amount of hail damage,** p. 204–210.
Crary, A. P., Cotell, R. D. and Oliver, Jack: **Geophysical studies in the Beaufort Sea, 1951,** p. 211–216.
Todd, D. K. and Wiegel, R. L.: **Near-coastal storms and associated waves,** p. 217–225.
Lin, Pin-Nam: **Numerical analysis of continuous unsteady flow in open channels,** p. 226–234.
Taylor, Arnold B. and Schwarz, Harry E.: **Unit-hydrograph lag and peak flow related to basin characteristics,** p. 235–246.
Gumbler, E. J. and Chow, Ven Te: **"A general formula for hydrolic frequency analysis,"** p. 277–282.
Moore, Raymond C.: **Stratigraphical viewpoints in measurement of geologic time,** p. 150–156.

Commission Pour L'Étude des Relations entre les Phénomènes Solaires et Terrestres. Septième Rapport, 1951.

Ellison, M. A.: **Recent advances in the observation of solar flares (chromospheric eruptions),** p. 11–29.
d'Azambuja, L.: **L'observation de la couronne solaire en dehors des éclipses. Note sur les disparitions brusques de protuberances,** [The observation of the solar corona without eclipses. Note on the sudden disappearance of protuberances], p. 31–38.
Link, F.: **Rayonnement solaire de courtes longueurs d'onde,** [Short wave solar radiation], p. 39–55.
Righini, G.: **La radiation intégrale du soleil,** [The total radiation from the sun], p. 57–62.
Allen, C. W.: **Observations of solar radio-noise,** p. 63–75.
Laffineur, M.: **Évolution des théories du rayonnement électromagnétique solaire aux fréquences radioélectriques,** [Evolution of the theories of electromagnetic solar radiation at radio-electric frequencies], p. 77–86.
Michard, Raymond: **Le contrôle de l'ionosphère par le rayonnement ultraviolet solaire,** [The control of the ionosphere by ultraviolet solar radiation], p. 87–105.
Newton, H. W.: **Observational aspect of solar corpuscular radiation,** p. 107–130.
Ferraro, V. C. A.: **Theoretical studies relating to solar corpuscular streams and geomagnetic storms,** p. 131–134.
Daudin, J.: **Le soleil et les rayons cosmiques,** [The sun and cosmic rays], p. 135–164.
Nicolet, M.: **Problèmes de l'émission spectrale du ciel nocturne et des aurores,** [Problems of the spectral emission of the night sky and of auroras], p. 165–182.
Brooks, C. E. P.: **The relations of solar and meteorological phenomena,** p. 183–198.

Geophysical Magazine, Tokyo, Volume 22, Number 3, February 1951.

Fukuoka, A.: **A study on 10-day forecast. (A synthetic report),** p. 117–208.
Fujita, T.: **Micro-analytical study of cold front,** p. 237–277.

Geophysical Magazine, Tokyo, Volume 22, Number 4, August 1951.

Wadati, Kiyoo: **In memory of Prof. Dr. Sakuhei Fujiwhara,** p. 279–281.
Saito, N. and Ito, K.: **On the velocity distribution in a simple vortex,** p. 283–288.
Otani, T., Kanzai, S. Fujiwhara, Sakuhei and Syono, S.: **On the behaviour of two coupled vortices and velocity distribution within them,** p. 289–310.
Fujiwhara, Sakuhei, Syono, S., Takayama, T., Yajima, S., Tamano, M. and Miyabe, N.: **Quantitative investigation on Okada's law in the behaviour of two vortices,** p. 311–322.
Kimbara, J.: **On the animate growth of eddy current,** p. 323–333.
Fujiwhara, Sakuhei: **The vortex motion, laws of equality and inequality, the principle of birth, growth and death,** p. 335–343.

Geophysical Magazine, Tokyo, Volume 23, Number 1, December 1951.

Inoue, E.: **The application of the turbulence theory to the large-scale atmospheric phenomena,** p. 1–14.
Hatakeyama, H. and Hudimoto, S.: **On the potential gradient and the space charge in the lower stratum of the atmosphere,** p. 15–20.
Takeuchi, U. and Nakazawa, Z.: **On the relation between chlorinity of rain water and air mass,** p. 21–24.
Homma, S.: **On boundary shear waves at an inner zone with continuously varying properties and related problems for surface waves,** p. 25–54.
Wada, H.: **Infantile paralysis and atmospheric phenomena,** p. 55–58.
Kamiyama, K., Eguchi, M., Yatabe, Y. and Moriguchi, M.: **Determination of precipitable water in air by near infra-red spectrometry,** p. 59–64.
Otani, S.: **Theoretical aspect on size-distribution of cloud particles and its application to stratus cloud,** p. 65–73.
Shibata, Y.: **The theoretical investigation on the optical nature of particles of haze and some results of visibility observations taken in fog,** p. 73–102.
Sakuraba, S.: **On the energetics of horizontal lability (1),** p. 103–112.

Geophysical Magazine, Tokyo, Volume 23, Number 2, January 1952.

Sakuraba, S.: **On the energetics of horizontal lability (2),** p. 113–124.
Homma, S.: **Some problems on the thermo-elastic deformations of the earth's crust,** p. 125–144.
Homma, S.: **Initial value problem in the theory of elastic waves,** p. 145–182.
Suyehiro, S.: **Improvement of time accuracy in seismological observations,** p. 183–190.

Hemel en Dampking, Volume 50, Number 3, 1952.

Pelleboer, J. H.: **De strenge sneeuwinter 1941/42,** [The severe winter of 1941/42], p. 54.
Houtgast, J.: **De zonsverduistering van 25 Februari 1952,** [The solar eclipse of 25 February 1952], p. 41–47.

Hemel en Dampkring, Volume 50, Number 4, 1952.

Visser, S. W.: **De Europese moesson in Nederland.** [The European monsoon in the Netherlands], p. 61–66.
Woundenberg, J. P. M.: **De oude eik van Twickel. Bomen als weerkundige archieven.** [The old Van Twickel oak. Trees as weather archives], p. 66–68.
ten Kate, H.: **Optische verschijselen in April 1951.** [Optical phenomena in April 1951], p. 69–70.
Levert, C.: **Weeroverzicht Februari 1952.** [Weather summary for February 1952], p. 71.
Van der Bul, W.: **Waarom verging de "Flying Enterprise"?** [Why did the "Flying Enterprise" sink?], p. 72–73.
Van Ufford, H. A. Quarles: **Berichten uit de weerkamer. Regenval het centrum van een hogedrugebied.** [Reports from the Weather Bureau. Rainfall near the center of a high pressure area], p. 74–75.
Van der Ham, C. J.: **De recordkoude van 29 en 30 Mart 1952.** [The record cold spell on March 29 and 30, 1952], p. 76–77.

Hemel en Dampkring, Volume 50, Number 5, 1952.

Koch, L.: **Was het klimaat in het begin van de zeventiende eeuw zachter dan nu?** [Was the climate in the beginning of the seventeenth century milder than now?], p. 83–84.
Veldkamp, J.: **De theorie van Blackett prijsgegeven,** [The discarded theory of Blackett], p. 81–82.
Visser, S. W.: **Het klimaat van Westeuropa in de Middeleeuwen,** [The climate of Western Europe in the middle ages], p. 84–87.
Levert, C.: **Weeroverzicht Maart 1952,** [Weather summary for March 1952], p. 87–88.
Van der Ham, C. J.: **Hohedruk tussen Ijsland en Noorwegen,** [High pressure between Iceland and Norway], p. 88–89.

Journal of Geophysical Research, Volume 57, Number 1, March 1952.

Nagata, Takesi: **Characteristics of the solar flare effect (Sqa) on the geomagnetic field at Huancayo (Peru) and Kakioka (Japan),** p. 1–14.
Ferraro, V. C. A.: **On the theory of the first phase of a geomagnetic storm: a new illustrative calculation based on an idealised (plane not cylindrical) model field distribution,** p. 15–49.
Petrie, W. and Small, R.: **The intensities of ultraviolet features of the auroral spectrum,** p. 51–57.
Havens, R. J., Koll, R. T. and LaGow, H. E.: **The pressure, density, and temperature of the earth's atmosphere to 160 kilometers,** p. 59–72.
Snyder, W. and Helliwell, R. A.: **Universal wave polarization chart for the magnetoionic theory,** p. 73–85.
Ashburn, Edward V.: **The density of the upper atmosphere and the brightness of the twilight sky,** p. 85–93.
Shmoys, J.: **Limitations on the calculation of expected virtual height for specific ionospheric distributions,** p. 95–111.
Kiepenheuer, K. O.: **Emission of corpuscles from the sun,** p. 113–120.
Heppner, J. P., Byrne, E. C. and Belon, A. E.: **The association of absorption and Es ionization with aurora at high latitudes,** p. 121–134.
Shmoys, J.: **The reflection coefficient of the exponental layer,** p. 142–143.
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